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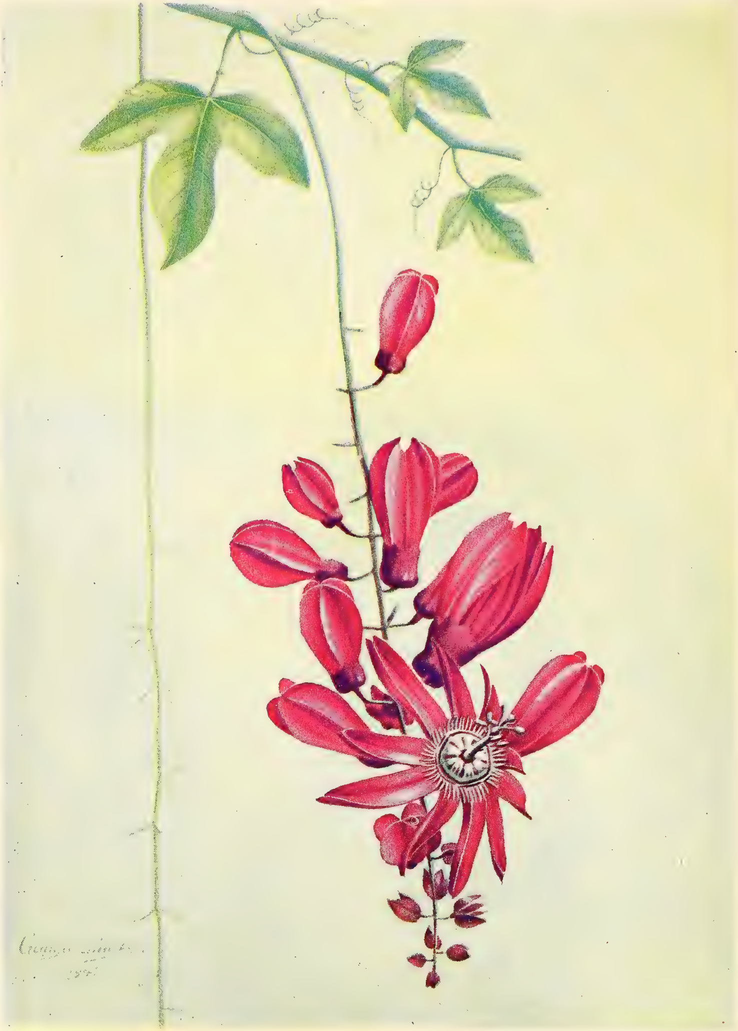

Princess Charlotte's Passion-flower.
PASSIFLORA RACEMOSA Brot.
(*about ½ natural size*)

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SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS.

BY

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Part XXVI.

[*Continued from Vol.* 46 (1947), p. 567].

(*With one coloured and* 3 *black and white plates and* 16 *text-figures*).

Passiflora Linn.

This genus, one of twelve which go to form the *Passifloraceae,* is commonly cultivated in Indian gardens on account of its strange flowers and handsome foliage. Some species produce an edible fruit of very delicate flavour. The name of the genus is derived from two Latin words, *passio,* suffering, and *flos,* a flower. The reason for this derivation will be seen later. With some unimportant exceptions the Passion-flowers are inhabitants of tropical South America where there is to be found a very large number of species.

The characteristics of the genus are as follows:—

Mostly climbers or scramblers with alternate usually lobed leaves and gland bearing petioles. Stipules are present, often foliaceous, sometimes cut into filamentous gland-tipped threads. The plants climb by means of lateral, simple spiral and elastic tendrils. The flowers, which are often large and showy, are axillary and may be solitary, in pairs or racemose, seated on a short pedicel which is joined to a 3-bracteate peduncle. The calyx is 4-5-lobed with a very short tube to which is attached the same number of petals and a double or triple showy fringe or corona. The ovary is supported on a stalk which also bears the stamens, 3-5 in number. The anthers are elliptic or oblong in shape and dehisce downwards. The ovary is globular or ellipsoid, one-celled with 3-5 parietal placentas, each bearing numerous ovules. The fruit is large or small, fleshy, containing many flat seeds, each surrounded by a fleshy envelope or arillus. The seeds are sculptured or pitted on both surfaces.

L. H. Bailey[1], quoting from Folkard's *Plant Lore, Legends and Lyrics*, gives an excellent account of the reasons why these plants have been named *Passiflora* and we reproduce it verbatim.

'The peculiar charm of these plants lies in the odd flowers, the parts of which were fancied by the early Spanish and Italian travellers to represent the implements of the crucifixion (whence both the technical and popular names). Legend and superstition have attached to these plants from the first. The ten coloured parts of the floral envelope were thought to represent the ten apostles present at the crucifixion, Peter and Judas being absent. Inside the corolla is a showy crown or corona of coloured filaments or fringes, taken to present the crown of thorns, or by some thought to be emblematic of the halo. The stamens are five, to some suggestive of the five wounds, by others thought to be emblematic of the hammers which were used to drive the three nails, the latter being represented by the three styles with capitate stigmas. The long axillary coiling tendrils represent the cords or the scourges. The digitate leaves suggest the hands of the persecutors. The following sketch of the passion-flower legend is from Folkard's *Plant Lore, Legends and Lyrics*, and the illustration (Fig. 2769) is also produced from that book: 'The passion-flower (*Passiflora caerulea*) is a wild flower of the South American forests, and it is said that the Spaniards, when they first saw the lovely bloom of this plant, as it hung in rich festoons from the branches of the forest trees, regarded the magnificent blossoms as a token that the Indians should be converted to Christianity, as they saw in its several parts the emblems of the passion of our Lord. In the year 1610, Jacomo Bosio, the author of an exhaustive treatise on the Cross of Calvary, was busily engaged on this work when there arrived in Rome an Augustinian friar, named Emmanuel de Villagas, a Mexican by birth. He brought with him, and showed to Bosio, the drawing of a flower so 'stupenduously marvelous', that he

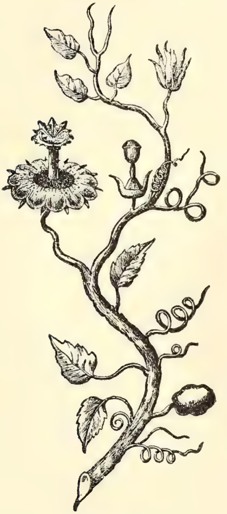
Fig. 1.—Old conception of the Passion-Flower, from Folkard's *Plant-Lore*, and there taken from Zahn.

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[1] L. H. Bailey, *The Standard Cyclopedia of Horticulture*, p. 2480.

hesitated making any mention of it in his book. However, some other drawings and descriptions were sent to him by inhabitants of New Spain, and certain Mexican Jesuits, sojourning at Rome, confirmed all the astonishing reports of this floral marvel; moreover, some Dominicans at Bologna engraved and published a drawing of it, accompanied by poems and descriptive essays. Bosio therefore conceived it to be his duty to present the *Flos passionis* to the world as the most wondrous example of the *Croce trionfante* discovered in forest or field. The flower represents, he tells us, not so directly the Cross of our Lord, as the past mysteries of the Passion. It is a native of the Indies, of Peru, and of New Spain, where the Spaniards call it 'the Flower of the Five Wounds', and it had clearly been designed by the great Creator that it might, in due time, assist in the conversion of the heathen among whom it grows. Alluding to the bell-like shape assumed by the flower during the greater part of its existence (i.e. whilst it is expanding and fading), Bosio remarks: 'And it may well be that, in His infinitive wisdom, it pleased Him to create it thus shut up and protected, as though to indicate that the wonderful mysteries of the Cross and of His Passion were to remain hidden from the heathen people of those countries until the time preordained by His Highest Majesty.' The figure given to the Passion-flower in Bosio's work shows the crown of thorns twisted and plaited, the three nails, and the column of the flagellation just as they appear on ecclesiastical banners, etc. 'The upper petals,' writes Bosio in his description, 'are tawny in Peru, but in New Spain they are white, tinged with rose. The filaments above resemble a blood-coloured fringe, as though suggesting the scourge with which our blessed Lord was tormented. The column rises in the middle. The nails are above it; the crown of thorns encircles the column; and close in the centre of the flower from which the column rises is a portion of a yellow colour, about the size of a reale in which are five spots or stains of the hue of blood, evidently setting forth the five wounds received by our Lord on the Cross. The colour of the column, the crown, and the nails is a clear green. The crown itself is surrounded by a kind of veil, or very fine hair, of a violet colour, the filaments of which number seventy-two answering to the number of thorns with which, according to tradition, our Lord's crown was set; and the leaves of the plant abundant and beautiful, are shaped like the head of a lance or pike, referring, no doubt, to that which pierced the side of our Saviour, whilst they are marked beneath with round spots, signifying the thirty pieces of silver.'

A comparison between the figures from Folkard's book and our artist's drawing of the same plant (*Passiflora caerulea*) will show to what length men, their minds obscured by religious fanaticism and superstition, were prepared to go in the seventeenth century in order to further their religious belief. The generic name perpetuates this phantasy and remains as a monument to fanatical self-deception but there is no need to seek a supernatural explanation for the odd shape assumed by the flower. In *Passiflora* the tendency is towards cross-fertilisation and the flowers are adapted to this end an explanation which, no doubt, will be deemed prosaic when compared with the flights of imagination of the early explorers of South America.

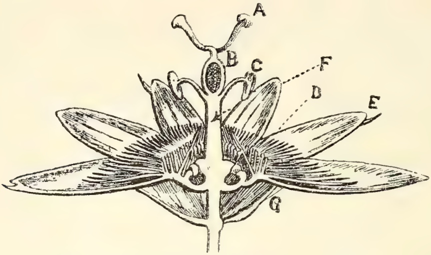


Fig. 2.—*Passiflora caerulea* after Baillon.

A. Styles and stigmas; B. Ovary or gynophore; C. Stamens; D. Corona; E. Perianth lobes; F. Gynophore; G. Bracts.

If a bud of a species of *Passiflora* is examined it will be found that the anthers, erect in the bud, face inwards. As the flower expands the filaments assume a horizontal position and the anthers face downwards. A portion of the pollen is discharged upon the corona and portion is retained by the anthers. The corona is often attractively coloured and sometimes the flowers are fragrant. As an additional attraction a ring of nectar secreting glands is developed within the calyx tube.

The flowers of *Passiflora* are protandrous which means that the stamens are mature before the stigmas are receptive. An additional safeguard against self-fertilisation is the position of the styles and stigmas which stand erect, well above the level of the stamens. After the stamens have discharged their pollen the styles curve downwards and the stigmas take up a position which is below the original level of the anthers. Consider, therefore, what happens when an insect-visitor comes to a freshly opened flower to obtain nectar. The visitor must circumambulate the corona to get at the nectar and in doing so either picks up pollen from the corona on its ventral surface or is well dusted over the back with pollen from the stamens. Should the visitor fly to an older flower it will almost certainly transfer some of its load of pollen to the stigmas and cross-fertilisation is effected. Humble bees and humming birds are the unconscious agents of cross-pollination in the tropics of South America.

Henslow writing in the *Transactions* of the Linnaean Society for 1879, p. 366, has the following passage regarding *Passiflora gracilis* 'This species, unlike other Passion-flowers, is an annual, a feature characteristic of self-fertilisers and "produces spontaneously numerous fruits when insects are excluded, and behaves in this respect very differently from most of the other species in the genus, which are extremely sterile unless fertilised with pollen from a distinct plant" (Darwin), or even species. It is worthwhile noting that this species differs from other members in the young internodes having the power of revolving. It exceeds all the other climbing plants which I have examined in the rapidity of its movements, and all tendril-bearers in the sensitiveness of the tendrils. Such would seem hardly compatible with Mr. Darwin's idea of self-fertilisation being injurious. Mr. Darwin also records the fact that flowers on a completely self-impotent plant of *Passiflora alata* fertilised with pollen from its own self-impotent seedlings were quite fertile.'

The edible passion-fruit is hardly larger than a hen's egg and contains little pulp. The fruit is, however, prized on account of its delicate flavour, and the pulp is widely used to add zest to puddings, drinks, ices and the like.

KEY TO THE SPECIES.

Leaves simple.
Flowers very small less than .5 in. across, green ... *P. minima.*
Flowers large, 4 in. or more across, mauve ... *P. quadrangularis.*
Leaves lunate.
Lobes of leaf rounded at the tips, upper surface with glands ... *P. lunata.*
Lobes of leaf sharp, upper surface of leaf without glands ... *P. Leschenaultii.*
Leaves 5-lobed ... *P. caerulea.*
Leaves 3-lobed.
Flowers small, not more than .75 in. across.
Leaves with short lobes, glabrous: flowers green, .5 in. across, bark not corky ... *P. minima.*
Leaves with long lobes, hairy: flowers greenish-yellow, .5 in. across; bark corky ... *P. suberosa.*
Flowers more than .75 in. in diameter, often much more.
Lobes of leaf closely serrate.
Petals pale pink; flower 2-2.5 in. across ... *P. incarnata.*
Petals white often tinted with purple; flowers 1.5 in. across ... *P. edulis.*
Lobes of leaf not closely serrate.
Leaves hairy.
Flowers reddish or pink ... *P. ciliata.*
Flowers white or whitish
Lobes of the leaf projecting in a bristle ... *P. holocericea.*
No bristle to the lobe of the leaf.
Plant very glandular: lobes entire ... *P. foetida.*
Plant not glandular: lobes toothed ... *P. morifolia.*
Leaves glabrous.
Flowers red or reddish ... *P. racemosa.*
Flowers whitish or greenish
Stipules foliaceous; lobes of leaf deep ... *P. calcarata.*
Stipules not foliaceous; lobes of leaf shallow ... *P. gracilis.*

Passiflora minima Linn.

SMALL PASSION-FLOWER.

(*minimus* in Latin means 'least', referring to the size of the flowers which, although small, actually are not the smallest in the genus).

Description.—A slender cirrhose climber with many terete smooth green stems. Shoots covered with an evanescent crisped hairy covering. Leaves up to 4 in. long by 2 in. broad, stipulate ovate, elliptic-ovate or oblong entire, or 1-2-lobed, glabrous; petiolate, dark green above paler below; petiole about .75 in. long terete but grooved above, covered above with crisped white hairs, decorated with a pair of stalked glands above the middle; tendrils axillary; stipules linear-setaceous.

Flowers small, and very inconspicuous being hidden by the leaves, on solitary peduncles in the axils of the leaves. Perianth-tube brownish green, flat, very short, 4-5-lobed; lobes triangular or oblong-obtuse, glabrous, green outside, about .3 in. long. Petals absent. Corona 4-partite; the outer filaments shorter than the sepals rather stout, truncate at the tips, yellow; second row very short, club-shaped; third row a closely pleated membrane; very short, purple outside, woolly at the apex; inner row a very short purple continuous membrane. Ovary erect upon a gynophore, 3-celled with 3-parietal placentas; styles three spreading; stigmas globular, stamens five. Fruit a juicy black or purple berry, .3 in. in diameter.

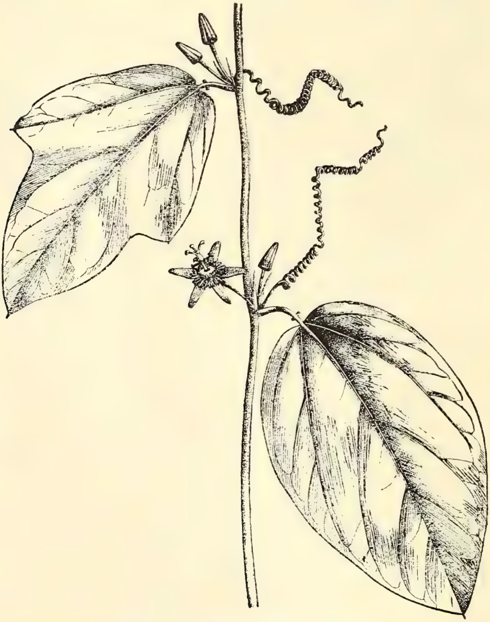


Fig. 3.—*Passiflora minima* Linn.

Flowers.—Hot and rainy season. *Fruits* rainy and cold season.

Distribution.—A native of the West Indies, occasionally cultivated in our country.

Gardening.—A slender twiner with small, insignificant flowers and dark-blue berries. It hardly deserves a place in the garden. Propagated usually by seed.

Passiflora quadrangularis Linn.

GIANT GRANADILLA.

Description.—This species is a strong robust climber with a quadrangular glabrous stem, winged on the angles. Leaves alternate, 4-8 in. long, 3-4 in. wide, petiolate, stipulate, broadly ovate or ovate-oblong, entire on the margins, absolutely glabrous, rounded, shallowly cordate or truncate at the base, abruptly acuminate at the apex, peninerved with 10-12 principal lateral nerves; petiole, winged below, channelled above, bearing 4,5 or 6 shortly stalked glands on the margins of the channel, the glands usually paired; stipules ovate to ovate-lanceolate up to 1.5 in. long.

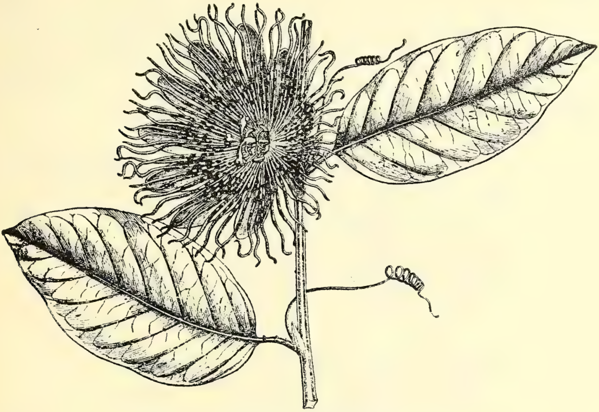


Fig. 4.—*Passiflora quadrangularis* Linn.

Flowers solitary on stout peduncles in the axils of the leaves; peduncles stout, terete, up to 1.5 in. long, bearing three bracts inserted on a level at the centre; bracts ovate cordate, about 1 in. long, glabrous, entire, toothed or serrulate below. Sepals leathery, green outside, pinkish green inside, calyx-tube short, sepal-lobes imbricate, ovate, very obtuse at the apex, glabrous; margins incurved. Petals 5, alternate with the sepals, oblong-ovate or oblong-lanceolate, obtuse or truncate at the apex, glabrous rather fleshy, pink or mauve outside, white, blue, violet or pinkish inside, equal in length to the sepals, 2-2.5 in. long. Corona 5-ranked, the outer two ranks thread-like, with the threads up to 2.5 in. long, terete, radiate, transversely banded with reddish purple and white at the base, blue in the middle, densely mottled with pinkish blue or mauve on the upper half; third rank of deep reddish-purple tubercles about .1 in. long, the fourth rank thread-like, with white threads banded at equal intervals with reddish-purple; the fifth rank membranous, lacerate. Operculum membranous, denticulate, white, reddish-purple on the margin. Ovary ovoid; stamens five; stigmas three. Fruit oblong-ovoid, yellow, longitudinally 3-grooved, up to 12 in. long (according to Killip). Seeds broadly obcordate, reticulate at the centre of each face, radially striate at the margins.

Flowers and fruits.—Rainy season.

Distribution.—A native of tropical America; widely grown in the tropics and sub-tropics of both hemispheres.

Gardening.—A strong, woody, quick-growing climber with quadrangular stems which are winged at the angles. It is a superb species with large ornamental flowers which are produced in great abundance during the rains. It is a good climber for a screen or a large trellis work and is frequently planted to cover pergolas and arbors. It is said that the wild prototype of tropical America is not good to eat and the cultivated plant should be called var. *macrocarpa.* Its fruits sometimes weigh several pounds. There is also a form in which the foliage is blotched with yellow.

Economic and medicinal uses.—The fruit is eaten green or ripe. If eaten green, it is boiled as a vegetable. If taken ripe, it may be iced and eaten with sugar. The fruit-wall may be candied.

The leaves are considered dangerous as they produce hydrocyanic acid and the roots are also stated to be poisonous.

Passiflora lunata Willd. (*P. biflora* Lamk.).

CRESCENT-LEAVED PASSION-FLOWER.

(*lunata* means 'crescent shaped' in Latin).

Description.—A wiry climber with angled stems covered with a minute pubescence which disappears with age. Stipules linear-acute, persistent. Tendrils axillary. Leaves alternate, short-petioled, shaped roughly like a quarter-moon, with blunt rounded lobes, shallowly cordate at the base, smooth and glabrous, reticulation prominent on both surfaces, but particularly so on the undersurface; midrib, and sometimes the nerves of the lobes, projecting as a small bristle; a row of gland arranged in a V-shape are often found between the midrib and the central nerves of the lobes; glands are small pits on the lower surface but their position is quite obvious as raised spots when looking at the upper surface.

Flowers solitary or in pairs from the axils. Pedicels jointed half way up, .5-.75 in. long bearing three filiform bracts at the joint. Hypanthium flat; sepals 5, oblong-obtuse, greenish-white, .5 in. long. Petals oblong-obtuse, about 1 in. long or less. Corona double; outer spreading, of narrow filaments up to 1 in. long or a little longer, upper half mauve, the inner half banded with purple and white; inner erect, very short, crowded at the base of the gynophore, upper purple crimson. Gynophore pale green, spotted with purple. Stamens 5, filaments green spotted with purple, anthers versatile. Ovary ovoid, superior, with three club-shaped styles. Fruit 2 in. long, oblong, yellow when ripe, edible.

Flowers.—Practically throughout the year. Does not fruit in Dehra.

Distribution.—Native of Mexico and Jamaica, now cultivated in all tropical and subtropical parts of the globe.

Gardening.—An extensive climber with 5-angled, stems, remarkable for its curious crescent-shaped leaves. The whitish flowers of moderate size are produced in constant succession all the year round. It was introduced into England by William Houston in 1733. Propagation is by layers and cuttings.

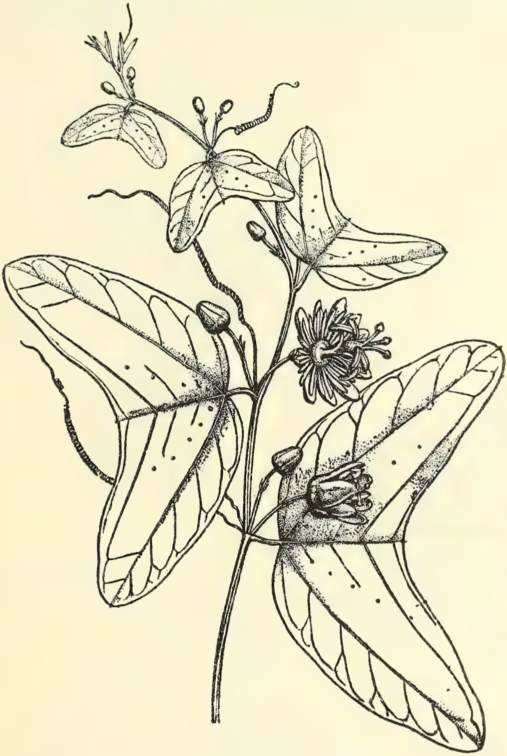


Fig. 5.—*Passiflora lunata* Willd.

Passiflora Leschenaultii DC.

(This species was named in honour of Leschenault, a French botanist).

Description.—A wiry climber with hirsute stems becoming glabrous with age. Stipules deciduous. Tendrils axillary, rather stout, glabrous. Leaves alternate 2-3 in. long, 4 in. wide from tip to tip, petioled, semi-circular, attached to the petiole by the centre of the rounded margin with a cuspidate point in the middle of the opposite side, sometime slightly 3-lobed with the two side angles produced, glabrous or rarely hirsute, 5-nerved from the base, the upper three straight from the base to the points of the opposite margins; petiole up to 1.5 in. long, glabrous or hairy with two scale-like glands in the lower half.

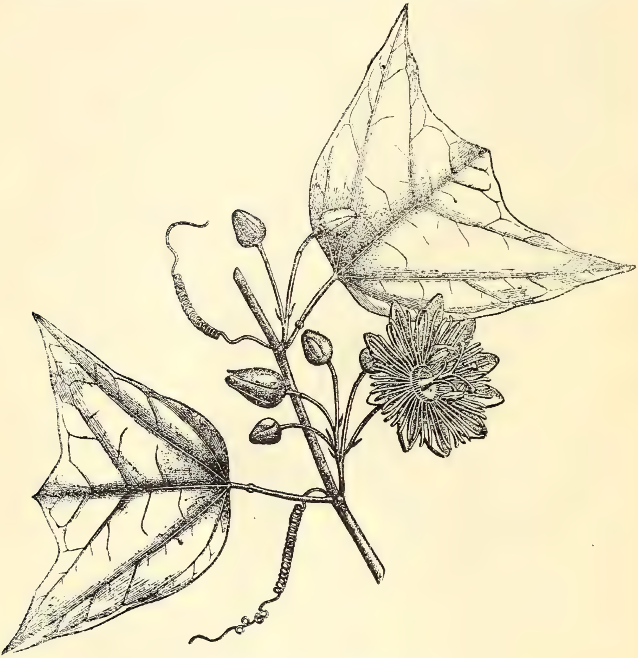


Fig. 6.—*Passiflora Leschenaultii* DC.

Flowers in pairs in the axils or paniculate, pedicelled. Pedicel joined ½ to 1/3 in. below the flower. Bracteoles 3, linear, hairy. Receptacle flat; sepals 5, .75 in. long, oblong-obtuse, greenish. Petals 5, similar in shape to the sepals, slightly shorter and narrower, white. Outer corona of 2 rows of linear filaments, the outer row shorter than the petals. Inner corona a much folded membranous cup; inside this again a small shallow cup round the base of the column. Gynophore .25 in. long. Stamens 5. Ovary globose or ellipsoid. Fruit ovoid, 1.5 in. long.

Flowers and fruits.—Cold season.

Distribution.—Native of the Western Ghats, in the Nilgiris and Pulneys, above 5,000 ft.

Gardening.—A wiry climber with half-moon-shaped leaves and white flowers. It can in no way be recommended for a garden and is for all practical purposes a weed. Easily raised from seed.

Passiflora caerulea Linn.

(*caerulea* means 'blue' in Latin, and refers to the colour of the tips of the corona filaments).

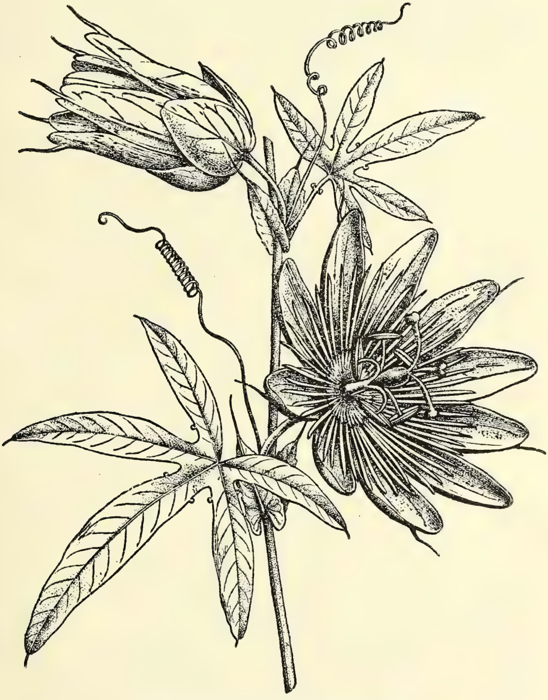


Fig. 7.—*Passiflora caerulea* Linn.

Description.—A strong climber. Stems terete, glabrous and smooth. Stipules foliaceous, semi-circular, shallow cordate at the base, margins lobed or toothed, often glandular. Tendrils axillary, simple. Petioles smooth and glabrous often with several stalked, globular glands scattered irregularly over its length. Leaves divided almost to the base into 5 lanceolate or narrowly elliptical acute lobes, green above, somewhat glaucous below.

Flowers large, 3-4 in. across, solitary, axillary, pedicellate. Pedicels many 1 in. long, bearing three large, ovate-cordate obtuse bracts, about 1 in. in length. Hypanthium saucer-shaped. Sepals 5, oblong, ending in a short awn-shaped process, greenish outside. Petals 5, oblong-obtuse, pale-pink in colour. Rays of the corona in two series, the outer blue at the tip, white in the centre, purple at the base. Gynophore and filaments green, spotted with purple. Styles 3, purple, club-shaped. Fruit the size of a small olive, pale orange golden in colour.

Flowers.—Rainy season. Does not fruit in Dehra.

Distribution.—A native of Brazil, now very commonly cultivated in all tropical, subtropical and temperate countries of the world.

Gardening.—A hardy vigorous climber with dark green, shining 5-lobed leaves. It is one of the commonest and certainly one of the handsomest of all species of this genus. Flowers profusely during the rainy season. It prefers a sandy loam with admixture of leaf mould and animal manure. It will, however, grow successfully in a variety of soil. It is suitable for covering a great space of walls or trellis. Readily propagated by the numerous young suckers which it sends forth for a great distance all round or by seed, layers or cuttings. According to William Curtis it was introduced into England from Brazil about 1775. This species has considerably hybridized and hybrids with *P. alata, P. Raddina* and *P. racemosa* are commonly seen under cultivation.

P. caerulea-racemosa—is a hybrid between the two species whose name it bears. The flowers are very large and handsome, though not very brilliant, being of a pale lilac colour, prettily relieved with a pure white crown of rays. When grown in a large pot it continues to bloom constantly. It is preferable to re-pot the plant with fresh soil annually in the cold weather.

Passiflora suberosa Linn.

(*suberosa* means 'cork-like' and refers to the bark on the old stems).

Description.—An annual or perennial twiner. Older stems usually corky, whitish. Tendrils axillary, covered with short, appressed, white hairs. Stipules lanceolate-acuminate hairy. Leaves alternate, petiolate, slightly cordate at the base, 3-lobed; lobes lanceolate-acute, the two side lobes at an angle of 45° with the central, ciliate on the margins, glabrous above and below, or with short, white, appressed hairs, or densely appressedly hirsute all over; petiole about .5 in. long, velvety, with two shortly stalked, round glands at the middle or thereabouts.

Flowers small, about .5 in. across, axillary, solitary, pedicellate. Pedicels jointed half way up, with a few hairs at the joint, about .5 in. long. Receptacle saucer-shaped; sepals 5, .3 in. long, oblong-obtuse in shape, greenish-yellow in colour. Petals absent. Corona of several filamentous series, the outermost spreading and half as long as the sepals, followed by shorter threads, the innermost hair-

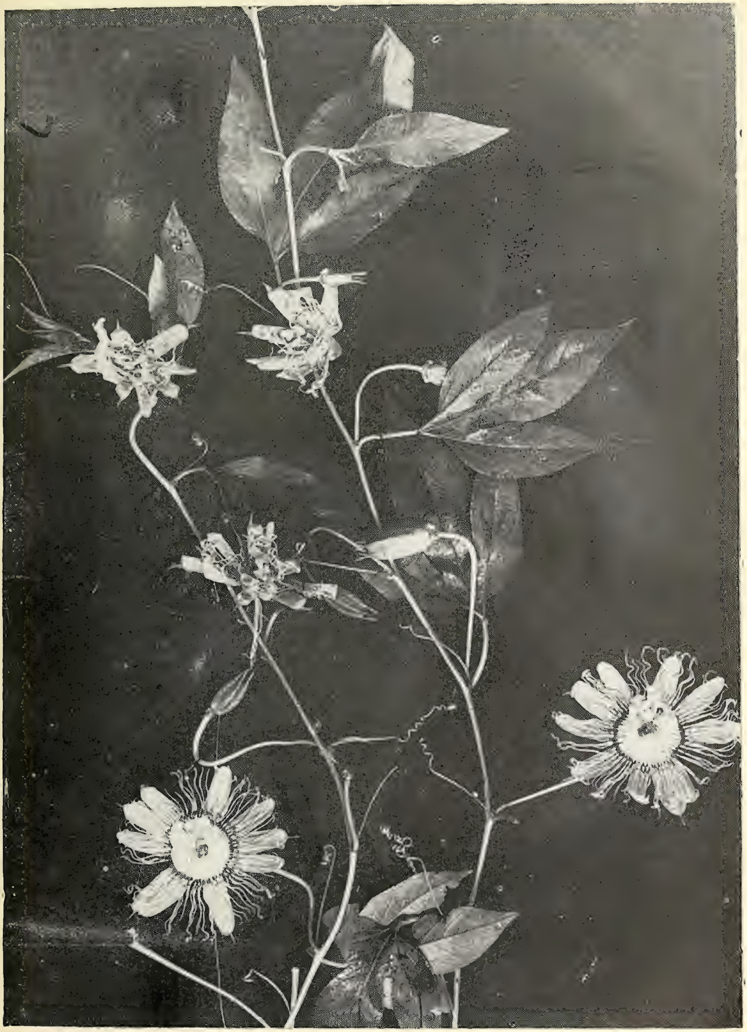


Photo by M. N. BAKSHI.

Passiflora incarnata Linn.
New Forest, Dehra Dun.

like; the median series plicate, fringed at the apex. Gynophore .1 in. long, slender. Stamens 5, filaments filiform; ovary globose, glabrous, ending in 3 slender styles. Fruit ovoid or globose, blue or purple, up to .75 in. long.

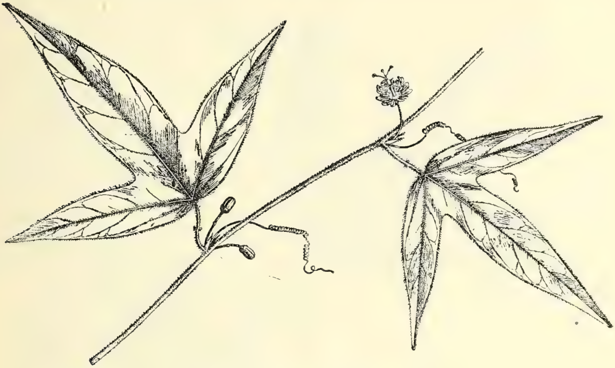


Fig. 8.—*Passiflora suberosa* Linn.

Flowers.—July to September. Fruits cold season.

Distribution.—A native of tropical America now naturalized in damp shady places in Dehra Dun.

Gardening.—A slender twiner with 3-lobed leaves and small greenish-white flowers. It is more of a weed than an ornament for any garden. Propagation is by seed.

Passiflora incarnata Linn.

WILD PASSION-FLOWER; MAYPOP.

(*incarnata* means 'flesh-coloured' in Latin and refers to the colour of the petals).

Description.—A wide spreading climbing creeper. Stems wiry, cylindrical, green, shining, almost glabrous. Leaves alternate with small stipules, petiolate; petiole hairy with two glands at the top, dividing at the apex into three nerves which pass out into the three lobes of the leaf; margins of the lobes serrate, those of the side lobes joining the two side nerves about .25 in. above the apex of the petiole. Lobes of the blade elliptic-acuminate in shape, dark green above, paler below; nerves hairy above and below. Petioles up to 1 in. long; leaves up to 4 in. long by 4 in. across. Tendrils axillary, long, simple.

Flowers axillary, solitary, seated on peduncles up to 3 in. long, showy, 2-2.5 in. across; peduncle hairy, striate, triangular in section just below the flower. Just below the flower are three glandular leaf-like bracts; bracts small, ovate acuminate in outline, serrate above, glandular below. Calyx-tube almost none; lobes 5 in number, oblong-obtuse, with a short awn-like projection just below the apex, above green or pale green in colour, rather soft up to 1 in. long. Petals 5, delicate, pale pink in colour.

Flowers.—Hot and rainy season. *Fruits.*—Cold season.

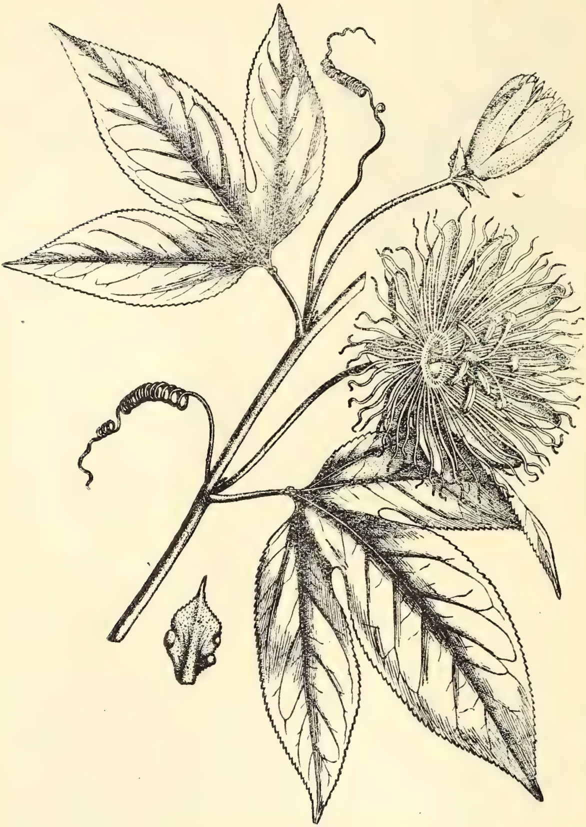


Fig. 9.—*Passiflora incarnata* Linn.

Distribution.—Native of Southern States of North America, now widely cultivated throughout the world.

Gardening.—A tall, perennial climber with broadly cordate, ovate 3-lobed leaves, bearing 2 glands near the top of the petiole. The pretty, axillary, solitary flowers, 2 in. across are white with a purplish corona and are borne in great profusion. It is a fine cover for arbors, verandahs, arches and the like. A liberal supply of manure is beneficial for its growth as this plant is a gross feeder and exhausts the soil quickly. Propagation is by seed and layers.

Passiflora edulis Sims.

THE EDIBLE PASSION FLOWER, PURPLE GRANADILLA.

(*edulis* means 'eatable' in Latin).

Description.—A widely spreading woody climber. Tendrils axillary, long, simple. Stipules linear, small. Leaves alternate, petiolate, up to 6 in. long by 6 in. broad, ovate cordate in outline, 3-lobed to half the length or more, coarsely serrate on the margins, terminal lobe broadly elliptic, acute or acuminate, side lobes obovate-acute or elliptic. Petiole up to 1 in. long, with two glands at the apex.

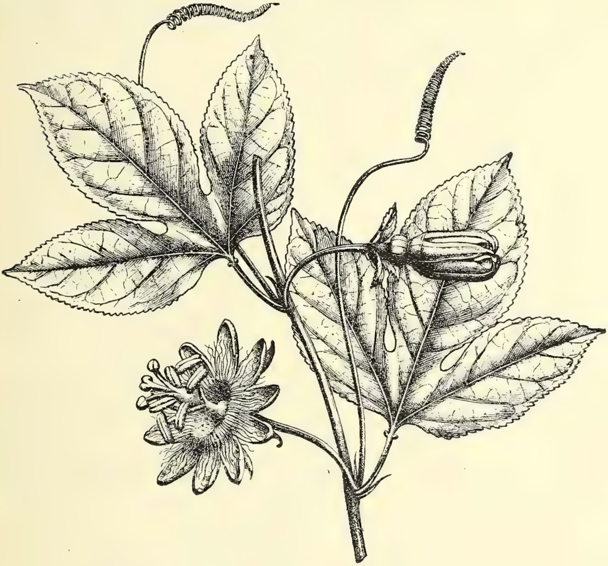


Fig. 10.—*Passiflora edulis* Sims.

Flowers solitary terminal or axillary, pedunculate. Peduncles up to 1.5 in. long. Below the flower are three bracts, ovate-acuminate in shape, the upper portion glandular serrate, the lower portion with 1-2 large glands on the margin. Calyx-tube hardly any, shallow, saucer-shaped. Lobes 5, oblong-obtuse, greenish, with a short awn-like projection below the apex. Petals 5, oblong, about .75 in. long, white often tinted with purple. Corona in several series, the outer spreading, not as long as the sepals and petals, white in the upper half, violet or purple below. Stamens 5; filaments inserted on the gynophore. Ovary ellipsoid, glabrous or woolly, surmounted by the three club-shaped styles and stigmas. Fruit globular-oblong, thickly purple-dotted, when ripe with a hard rind.

Flowers.—Hot and rainy season. *Fruits.*—Cold season.

Distribution.—A native of Brazil, now extensively cultivated in all parts of the world. Run wild below Kodaikanal near Ootacamund and near Yercaud, in South India.

Gardening.—A widely spreading, rather woody 'Vine' with large glossy, deeply 3-lobed and serrate leaves. The white, tinged with purple flowers, are produced in succession all through the summer and rains and are quite ornamental. It makes an excellent and rapid-growing cover for fences and trellises. It is, however, for the edible fruit that it is so extensively cultivated in many countries. The fruit under cultivation, according to Bailey, is considerably smaller than the Granadilla (*P. quadrangularis*), rarely larger than a hen's egg, and dull purple when ripe. Its pulp is slightly more acid than that of Granadilla, but of very pleasant flavour and highly esteemed in Queensland and New South Wales where the plant is cultivated commercially. It is used for flavouring sherbets, for confectionery, for icing cakes, for jams and for a variety of other purposes.

Like most species of *Passiflora* it grows with great rapidity and soon exhausts the soil. It is, therefore, necessary to give it a liberal supply of manure each year.

The fruits produced in Dehra and elsewhere in this country have, however, usually little pulp, the seeds occupying most of the interior. Propagation is by seed, layers or cuttings.

Medicinal and Economics uses.—According to Burkill, Hydrocyanic acid is met with in stem and roots of this plant.

Passiflora ciliata Ait.

FRINGED-LEAVED PASSION-FLOWER.

(*ciliata* refers to the fringed margins of the leaves).

Description.—A slender climber with smooth and glabrous terete stems. Stipules laciniate, each segment a glandular hair. Leaves alternate, petiolate, hastate in shape, the two lower lobes widely spreading the terminal lobe much longer, elliptic-obtuse in shape, 2 in. long, densely hirsute on both surface with appressed fulvous hairs, or only slightly hairy above; or almost glabrous with gland tipped hairs along the margin, densely hirsute on the margins. Petiole little more than .5 in. long, covered with golden hairs with here and there a longer gland-tipped hair and sometimes 1-2 sessile globular glands. Flowers axillary, pedicellate, solitary; pedicel 1 in. long. Involucral bracts 3, bi- and tri-pectinately divided, the

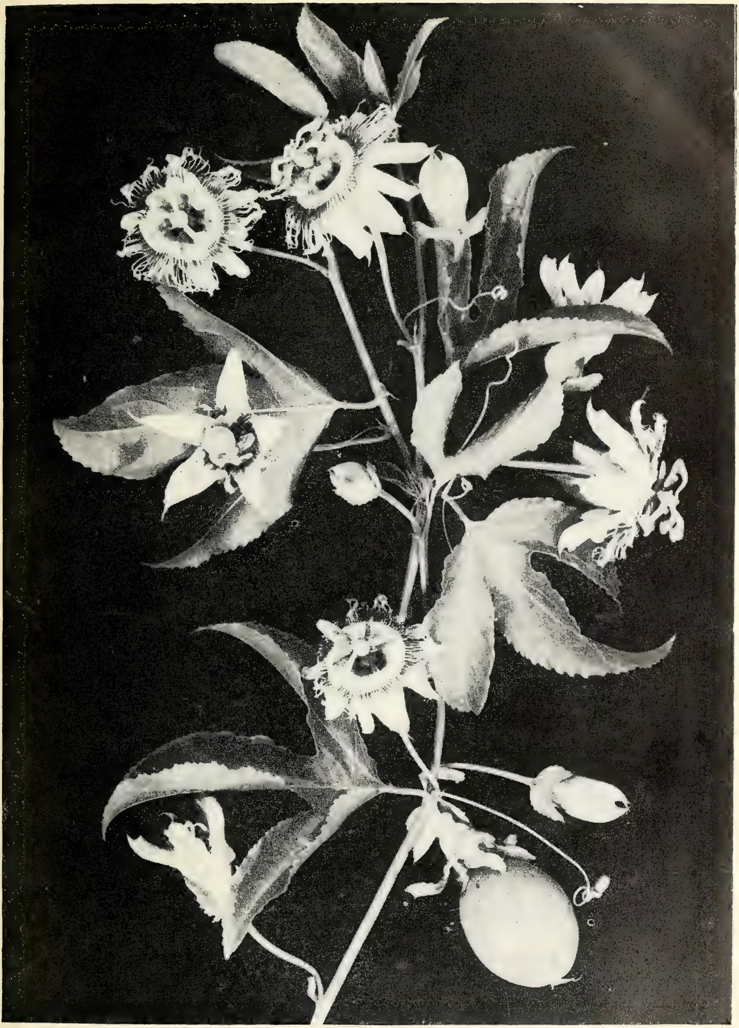


Photo by M. B. RAIZADA.

Passiflora edulis Sims.
New Forest, Dehra Dun.

ultimate segments capillary and gland tipped. These bracts are foetid when bruised. Calyx-tube a hypanthium; sepals 5, .3 in. long, greenish on side, pale on the margins. Petals 5, reddish or pink, oblong-obtuse. Corona several seriate, the outer filamentous, variegated white and purple, the inner erect and purple-tipped.

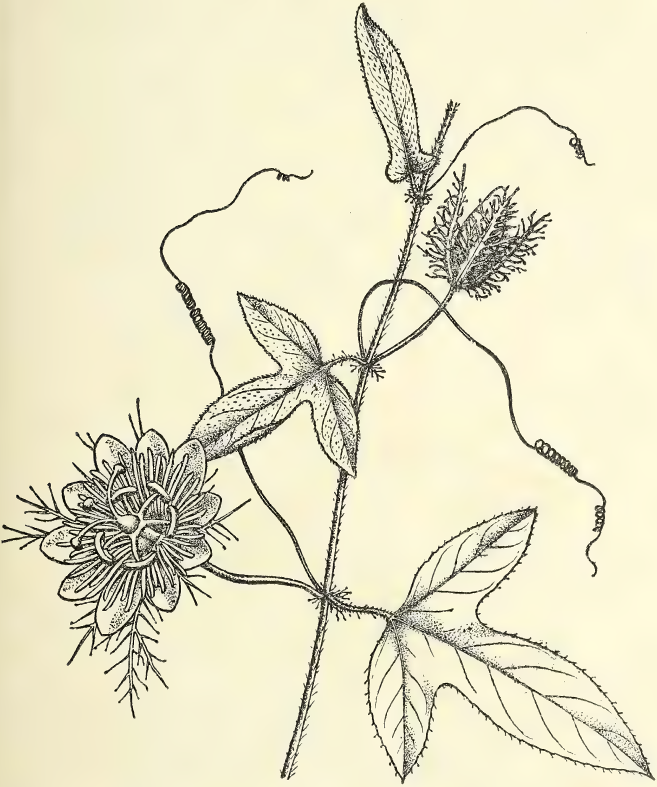


Fig. 11.—*Passiflora ciliata* Ait.

Gynophore deep purple in colour bearing the 5 purple-dotted filaments. Ovary purple, ellipsoid, ending in three clavate stigmas. Fruit ellipsoid, .5 in. long, enclosed in the involucral bracts.

Flowers and fruits.—Rainy season.

Distribution.—A native of the West Indies, occasionally cultivated in gardens throughout the country.

Gardening.—A slender climber at times attaining sufficient height. The dark green, glossy, 3-lobed leaves are usually glabrous except on the edges where they are beset with glandular hairs. The leaves of this species vary greatly in form according to the vigour and luxuriance of the plant. The rather small flowers are of a purplish colour. Multiplication is by seed or cutting. It prefers a cool situation. According to Curtis it was introduced into England by Mrs. Norman from the West Indies in 1783.

Passiflora holosericea Linn.

SILKY-LEAVED PASSION-FLOWER.

(*holosericea* means 'covered with silk' and refers to the pubescent stems and leaves).

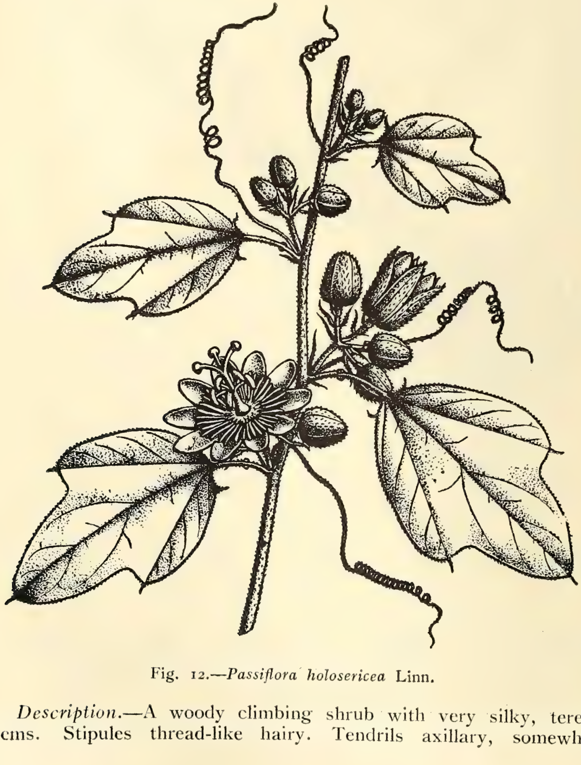


Fig. 12.—*Passiflora holosericea* Linn.

Description.—A woody climbing shrub with very silky, terete stems. Stipules thread-like hairy. Tendrils axillary, somewhat

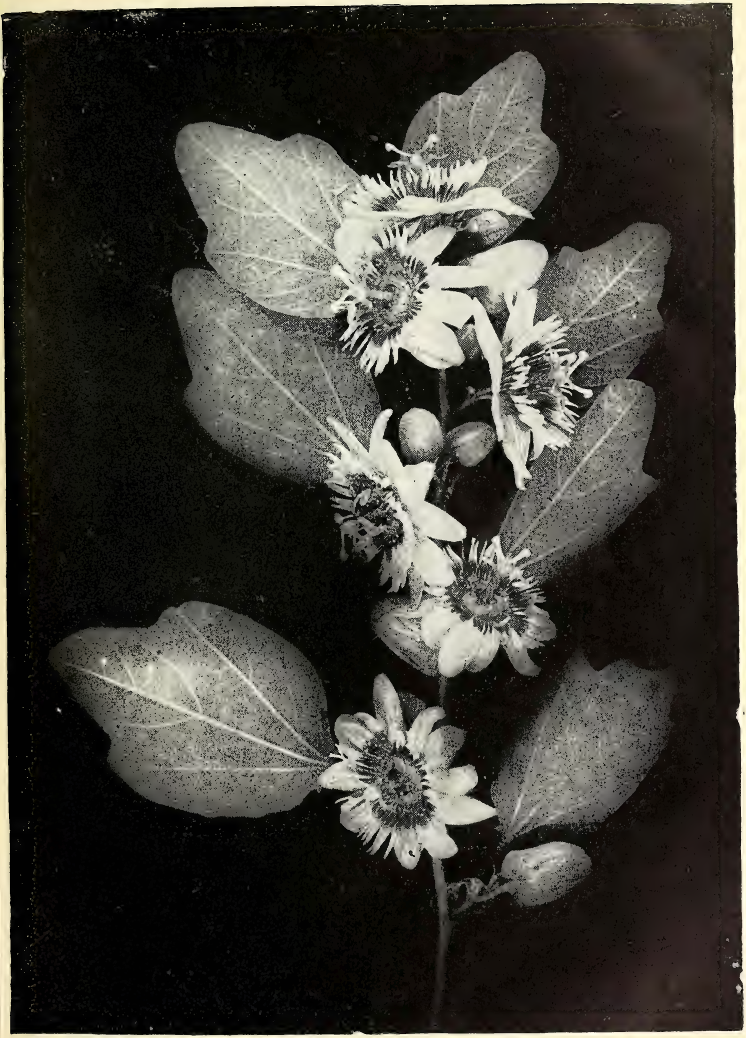


Photo by M. B. RAIZADA.

Passiflora holosericea Linn.
New Forest, Dehra Dun.

stout, hairy. Leaves alternate, petiolate, up to 4 in. long by 3 in. wide, densely covered on both surfaces with a short, crisped, silky pubescence, ovate in outline, shallowly 3-lobed; lobes rounded or even emarginate, sometimes obtusely-acute; midribs of the lobes projecting as a short bristle; petiole up to .5 in. long, short silky, with two scale-like glands about the middle.

Inflorescence axillary of 2 or more flowers in hairy peduncled umbels or racemes. Individual flowers pedicellate. An involucre of 3 linear bracts arises from the centre of the pedicel. Receptacle flat. Sepals 5, .75 in. long, narrowly ovate-obtuse, longitudinally veined, densely hairy. Petals 5, elliptic obtuse, white. Corona in several series, the outer filamentous; filaments yellow in the outer half, reddish or purplish in the inner; median membrane lacerate purplish-tipped. Gynophore .4 in. long, purplish. Stamens 5, filaments greenish, spotted with purple. Ovary ellipsoid, densely hirsute, ending in 3 slender styles, each with a capitate stigma.

Flowers.—Hot and rainy seasons. Does not set fruit in Dehra.

Distribution.—Native of Vera Cruz, in South America, now cultivated in all tropical and subtropical parts of the world.

Gardening.—An extensive, woody climber with ovate, 3-lobed leaves, pretty for the marking of their dull-red veins. The flowers are not very large, whitish, but borne in great profusion and strongly sweet-scented. Propagation is by layers and cuttings. It was introduced into the Chesla gardens by Dr. William Houston from South America before 1733. It is suitable for growing on an arch or a trellis work.

Passiflora foetida Linn.

STINKING PASSION-FLOWER.

(*foetida* is a Latin word meaning 'evil-smelling' and refers to the odour emitted by the plant when crushed).

Description.—A herbaceous climber, more or less viscous, densely hirsute throughout with yellowish-brown hairs. Stipules semi-circular about the stem, deeply cleft into filiform, gland-tipped segments. Leaves alternate, petiolate, ovate-cordate in outline, 3-lobed, membranous, usually glandular ciliate, sparingly to densely appressed hirsute, 3 in. long by 2 in. wide, the middle lobe lanceolate or ovate-lanceolate, acuminate, the lateral lobes sub-orbicular, often apiculate; petioles slender up to 2.5 in. long, glandular-ciliate but without true petiolar glands.

Flowers solitary, seated on axillary peduncles which are up to 1.5 in. long. Bracts ovate in general outline, .75—1.5 in. long, bi- or tri-pinnatisect, the ultimate segments filiform, gland-tipped, closely interwoven in the bud but much less so when the flower opens. Calyx-tube short, campanulate. Sepals and petals oblong or ovate-oblong, .7 – 1 in. long, white, often tinged with lilac. Corona filaments in several series, the outer 2-radiate, filiform, violet and white or purple and white, the other series short, violet. Ovary globose, densely pilose with white or brown hairs. Fruit globose up to 1 in. in diameter, yellowish, densely to sparingly hairy.

Flowers and fruits.—Rainy season but often at other times of the year.

Distribution.—A native of tropical America, now run wild in various parts of India, Ceylon, China and Malaya.

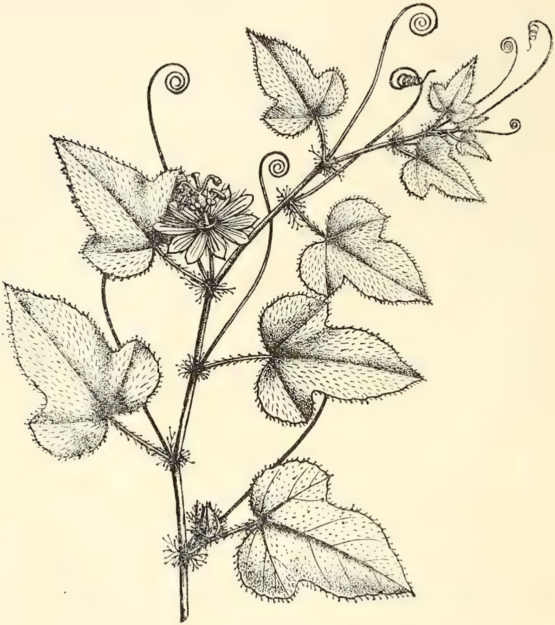


Fig. 13.—*Passiflora foetida* Linn.

Gardening.—A small herbaceous species at once recognised by the moss-like pectinate involucre of the flowers. The leaves when bruised emit a disagreeable smell and are not eaten by cattle. The flowers are small and white and not showy. Bears fruits abundantly. Propagation is by seed. It is more like a weed and is not worth growing in a garden. It was introduced into England as far back as 1731 and in India over a century ago.

Medicinal uses.—The plant is reported to be used in Malaya to cure itches. The hydrocyanic acid which is present in the leaves apparently helping in doing this. The leaves are applied on the head for giddiness and headache and a decoction is given in biliousness and asthma. It is considered as an emetic.

Passiflora morifolia Mast.

(*morifolia* means in Latin 'mulberry-leaved', and the plant is so called from the supposed resemblance of its foliage to that of the mulberry).

Description.—A slender twiner with hairy, angled stems. Stipules foliaceous, .25 in. long, ovate cordate, or semi-orbicular, hairy. Tendrils axillary, hairy, slender. Leaves alternate, petiolate, ovate-cordate in outline, glabrous or hairy on the upper and lower surfaces, particularly on the nerves, 3-lobed; lobes ovate-acute; margins of the centre lobe entire or with widely spaced glandular teeth; side lobes dentate on the outer margin, round to the insertion of the petiole; the teeth ending in glands; petiole up to 2 in. long, bearing 2 stalked glands above the middle.

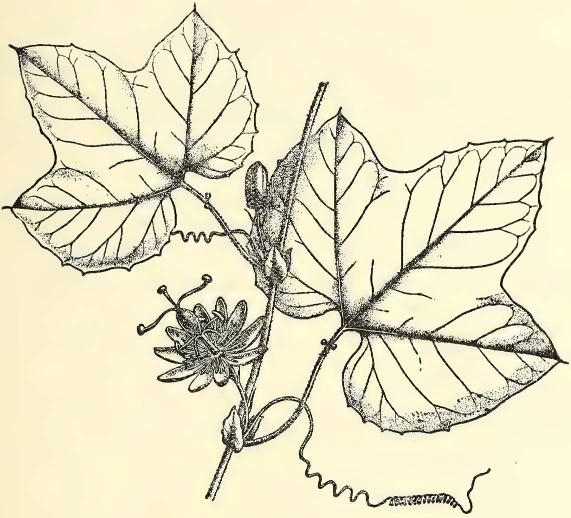


Fig. 14.—*Passiflora morifolia* Mast.

Flowers axillary, solitary, pedicellate; pedicels with three filiform bracteoles just below the calyx or scattered. Calyx-tube campanulate, short, pubescent; calyx-lobes lanceolate, .75 in. long, green, pale on the margins. Petals O. Corona in three series, the outer filamentous, half as long as the sepals, the centre series short, curved, the inner a narrow membrane. Gynophore slender; stamens 5; filaments attached to the top of the gynophore. Ovary globular, velvety, ending above in three slender styles. Fruit globose, purple, 1 in. long; seeds pitted on both surfaces.

Flowers and fruits.—Rainy season.

Distribution.—Native of Brazil, occasionally cultivated in this country.

Gardening.—A slender hairy twiner with small, insignificant flowers. It is not worthy to be grown in a garden. Easily raised from seed.

Passiflora racemosa Brot.

PRINCESS CHARLOTTE'S PASSION-FLOWER.

(*racemosa* refers to the inflorescence which consists of stalked flowers on a central axis, that is, a raceme).

Description.—A powerful climbing shrub with a cylindrical, glabrous, smooth stem, woody, sometimes corky below. Leaves alternate, petiolate, stipulate, 3-4 in. long, up to 3 in. broad, glabrous, smooth, leathery in texture, deep green in colour, shallowly cordate at the base, all three-lobed except the lowest which may be ovate; lobes ovate-acute or oblong-ovate-acute, entire on the margins, penni-nerved, each with a principal central vein making the whole leaf three-nerved; petiole attached to the blade just above the base, making it sub-peltate cylindrical, glabrous, bearing about 4 sessile glands; stipules foliaceous, obliquely ovate-acute, glabrous, smooth, with a median nerve, up to 1 in. long and as broad. Tendrils long, filiform, spirally twisted, arising from the axils of the leaves.

Inflorescence a long, terminal, pendulous raceme, 7-8 in. or more in length, leafless, having stipules in place of leaves; sometimes, especially when it does not support any fruit, it remains alive and produces new branchlets from the axils of the dead peduncles. Flowers solitary (but the peduncles usually two from an axil, with the tendril in the middle between them, becoming racemose on the ends of the shoots), 4 in. or more across, inodorous, the narrow petals deep red and widespreading, the short, upright crown purple.

Calyx inferior, glabrous, forming a tube below, limb deeply 5-cleft; sepals not conforming with the corolla petals, dirty purple outside, very broadly keeled, the keel curved like a sword, scarlet in colour. Before the flower opens the keels of the calyx give the buds a five-winged appearance.

Petals 5, inserted on the throat of the calyx, and a little shorter than the lobes of the calyx, spreading, semilanceolate, somewhat obtuse, entire, somewhat flattened, outside slightly keeled, inside chanelled in its native ground, purple on both sides.

Nectary corona triple, filamentous, all the hairs being whitish on the upper side, blue on the lower side; the innermost corona equal in height to the outer corona, the hairs closing round the cylindric stipes, equal among themselves, simple, joined with a membrane from below, adnate to the elevated margin of the receptacle which goes round the base of the calyx; the two other coronas inserted on the throat of the calyx below the petals, the intermediate one shorter, hairs being scarcely exserted outside the calyx throat, erect, subcapitate at the apex, equal among themselves; the exterior corona with simple hairs which are produced two or three lines outside the calyx throat, patent, unequal, the hairs which are opposite to the calyx-lobes being longer.

Staminal filaments 5, inserted on the apex of the stipe below the ovary, slightly united at the base green, sublinear, erect-spreading. Anthers sublinear, obtuse with a short acumen, leaning, in colour from green to yellowish, unisulcate in the middle and at the sides, bilocular.

Ovary superior, oblong, subovoid, obsoletely trisulcate, glabrous, pale green, with the style prolonged up to one inch beyond the calyx throat, cylindric, green, broader at the base which is pentagonal. Styles 3, somewhat thicker above, pale green, recurved towards the anthers. Stigmas capitate, from yellowish to green.

Fruit a berry, pedicellate, ovoid, trisulcate, glabrous, pale green, up to 2 in. long, unilocular, many-seeded, fleshy, finally dry.

Flowers.—Hot and rainy season. Has not fruited in Dehra up till now.

Distribution.—A native of Brazil, now commonly grown in all tropical and subtropical parts of the world.

Gardening.—This very choice and handsome climber which is decidedly one of the best red-flowered *Passifloras* bears scarlet or deep-red flowers in great profusion, but unfortunately all the flowers of the raceme do not open out at the same time. A liberal supply of manure and leaf mould is considered beneficial at the beginning of the cold weather. It is a very suitable object for growing over an arch or pergola. Propagation is by seed or layers. It is a fine old species and is a parent of various garden hybrids of this genus. According to Firminger it thrives much better by grafting it on a strong species but in Dehra Dun plants raised from seed received from Leipzig are doing excellently well on their own roots.

Passiflora calcarata Mast.

MADAGASCAR PASSION-FLOWER.

(*calcarata* is a Latin word meaning 'spurred', and refers to the long spur on the sepal).

Description.—A wiry slender climber with glabrous stems. Stipule ovate-lanceolate, foliaceous, .75 – 1 in. long. Tendrils axillary, slender. Leaves alternate, sub-rotund in shape, petiolate, 2 in. long by 2.5 in. broad, glabrous, smooth, thin in texture, 3-lobed, lobes rounded at the apex; margins of the lobes with 2 glands just above the obtuse sinus; petiole slender, glabrous with 2 or more glands irregularly distributed.

Flowers solitary, axillary, pedicellate. Bracts 3, ovate-lanceolate up to .5 in. long. Hypanthium saucer-shaped. Sepals 5, oblong, obtuse at the tip, greenish, furnished with a short spur just below the tip .5 – .75 in. long. Petals 5, white, more delicate than the sepals. The corona consists of an outerset of slender filaments, white with a purple base and three tips, and an inner set of much smaller filaments which fit closely about the central column and cover a honey-secreting circular channel. Stamens 5; filaments attached to the gynophore. Ovary egg-shaped, with a slight bloom; stylar arms spreading upwards and outwards ending in large 2-lobed stigmas.

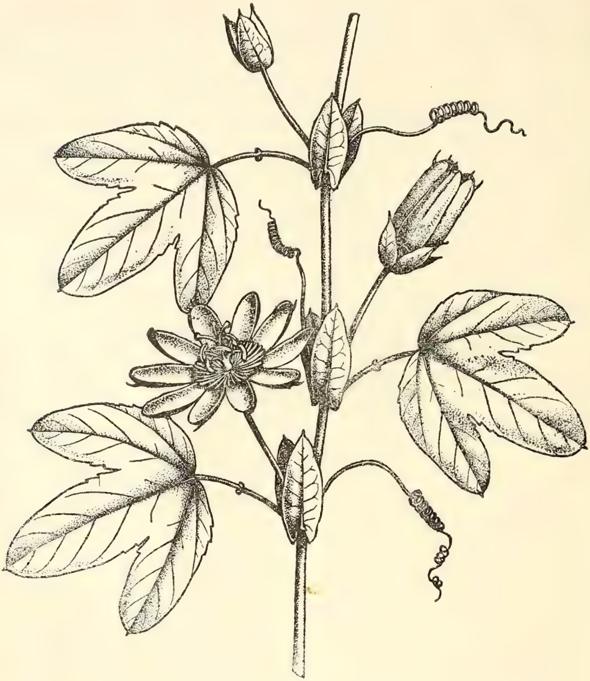


Fig. 15.—*Passiflora calcarata* Mast.

Flowers and fruits.—March to May.

Distribution.—A native of Madagascar, naturalized and run wild in the Nilgiris and elsewhere in the hills in South India.

Gardening.—A slender climber (of the section Granadilla) easily distinguished from the rest by its 3-lobed leaves and large stipules 75-1 in. long. Propagation is by seeds and layers. The flowers are ornamental.

Passiflora gracilis Jacq.

(*gracilis* means 'slender' in Latin and refers to the habit of the plant).

Description.—A slender climber with terete, glabrous stems. Tendrils very slender, axillary. Stipules minute, linear-acuminate, Leaves alternate, petiolate, deltoid in outline, very shallowly and bluntly 3-lobed, shallowly cordate at the base, thinly membranous, green on the upper surface, glaucous beneath, glabrous; petiole up to 1 in. long, with 2 glands at or below the middle.

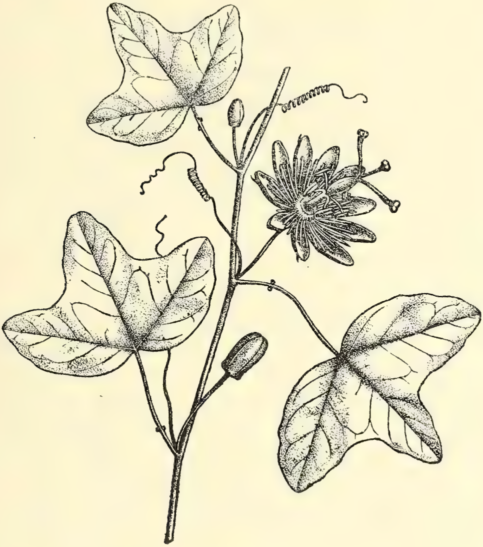


Fig. 16.—*Passiflora gracilis* Jacq.

Flowers solitary, axillary, on the peduncles about 1 in. long; the peduncles bear a pair of slender glandular bracts well below the bloom. Calyx-tube a hypanthium, flat; lobes 5, oblong-obtuse, green, tinged with pale violet on the margins; lobes .75 in. long, persistent. Petals 5, as long as the sepals and similar in shape, whitish or greenish in colour. Corona in 2 series, the outer filamentous, the inner a lacerated membrane. Gynophore .3 in. long, bearing the 5 stamens with versatile anthers; ovary ellipsoid, glabrous, ending in 3-clavate styles. Fruits ellipsoid, globose, purple, 1 in. long.

Flowers and fruits.—August to September.

Distribution.—A native of Brazil, now occasionally cultivated in all tropical and subtropical countries of the world.

Gardening.—A slender climber with broadly deltoid-ovate leaves which are shallowly and bluntly 3-lobed. The solitary, axillary, pale-green or whitish flowers about 1 in. across are not very showy. Easily multiplied by seed, layers or cuttings.

(*To be continued*)

THE EARLY STAGES OF INDIAN LEPIDOPTERA

BY

D. G. SEVASTOPULO, F.R.E.S.

PART XVIII

(*Continued from Vol.* 46, p. 586).

RHOPALOCERA

NYMPHALIDAE:

Pantoporia cama Moore.

Colour of pupal shell dull brown, the wing cases with a marginal series of darker spots. Head with a flattened, pointed, leaf-like process, which arises frontally and is then bent outwards at right angles. Meso-thorax with an outward-pointing, double point at the origin of the wing cases, and with a large median keel forming a backward-pointing, bluntly triangular process. 1st abdominal somite with an immense forward-curved dorsal process, almost meeting the thoracic keel. The 2nd to 6th abdominal somites each with a small dorsal ridge. 1st to 3rd abdominal somites each with a subdorsal tooth. The abdomen much constricted after the 6th somite. Suspended by the cremaster, but placed at an acute angle with the support, not hanging vertically as many Nymphalid pupae

Described from a pupa skin found at Tukdah (5,000 ft. Darjeeling Dist.) 24-ix-45, with a newly emerged female clinging to it.

Symbrenthia hypselis Godt., *cotanda* Moore.

Head black, shining and clothed with longish pale hair. Body black, a pair of white dorsal spots between the 1st and 2nd somites. 3rd to 5th somites coffee-brown, transversely streaked with black, 9th somite with a coffee-brown dorsal blotch. 1st somite unspined. 2nd and 3rd somites each with a subdorsal and lateral branched, brown spine. 4th to 11th somites each with a dorsal, subdorsal, lateral and sublateral branched, brown spine, the dorsal spine placed slightly in advance of the others. 12th somite with the subdorsal spines only. All somites with transverse lines of short, white, bristly hair. Venter, legs and prolegs black.

Pupa suspended by the cremaster. Pinkish grey, very minutely speckled with darker. A diffused green lateral stripe from the edge of the wing case on the 4th abdominal somite to the 6th. The head bifid, the points blunt. Thorax arched, the 1st abdominal somite constricted. A rounded prominence subdorsally on each somite, from the 2nd to 7th abdominal somites, that on the 2nd somite very small. The whole surface of the pupa very rough, a blackish raised speck on the discal area of the wing case. The base of the wing cases expanded slightly into two blunt points.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 16-x-45, pupated 18-x-45 and a female emerged 29-xi-45.

GRYPOCERA.

HETEROPTERINAE:

Notocrypta feisthamelii Bsd., *alysos* Moore.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 262. 1946.

The young larva differs from the adult by the head being completely black and the body without the dark green speckling.

Described from material found at Tukdah (5,000 ft. Darjeeling Dist.) in September 1945.

HETEROCERA.

ZYGAENIDAE:

Eterusia aedea L., *edocla* Dbl.

Jord., *Seitz Indo-Austr. Bombyces*, x, 34. 1908.

Head pale brown, retractile. 1st somite pale brown, retractile. Ground colour of body olive-yellow, a smoky brown dorsal line. 6th somite with a transverse smoky brown dorsal band, which joins the arms of a darker brown V-shaped mark extending from the 7th to 9th somites. A lateral series of oblique brown lines. 2nd to 11th somites with a subdorsal series of small black warts, each bearing one or two bristles, and a similar lateral series, except that the warts on the 2nd and 3rd somites are double, those on the 2nd yellow. A sublateral series of yellow warts from 4th to 11th somites, the 2nd and 3rd somites with very small, double, yellow warts. 12th somite with a transverse series of four yellow warts. All these warts exude a drop of liquid when the larva is alarmed. Venter, legs and prolegs pale yellowish.

Cocoon spun across the trough of a leaf, of the usual Zygaenid type of pale pinkish-buff, papery silk. Empty pupa skin brownish yellow.

Food-plant—Camelia.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 17-ix-45, spun 27-ix-45 and a female emerged 28-x-45.

Seitz' description is as follows:—'Larva very similar to that of *tricolor*, on tea and other plants; brown-yellow. Cocoon white, with a reddish tinge.' Gardner (*Indian Forest Records*, vii, 160. 1942) describes the larva of the Ceylon subspecies *cingala* Moore as having the head brownish, the general body colour varying from pale brown to bright brick-red, usually paler laterally and ventrally.

ARCTIIDAE :

Siccia (Aemene) taprobanis Wlk.

Head small and black. Body grey, 1st somite with a blackish transverse stripe on the anterior half. A pale grey dorsal blotch on the 4th, the 6th and 7th, and the 9th and 10th somites, and a pale grey transverse stripe on the 12th. Shape rather short and stout, and clothed with short, whitish bristles arising from small olive warts. Venter, legs and prolegs greyish.

Pupa in a slight web of white silk spun over a depression in the wall. Olive brown, the thorax slightly suffused with smoky, the abdominal somites each with a broad black transverse stripe containing a few dots of the ground colour. Wing cases veined with black. Cremaster a double, long, hooked spine, with a number of shorter, hooked spines round it.

Food-plant—Presumably Lichens growing on walls.

Described from a number of larvae and pupae found on a wall at Tukdah (5,000 ft. Darjeeling Dist.) 17-ix-45, from which a male emerged 20-ix-45.

Creatonotus transiens Wlk.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlii, 42. 1940.

Head black, shining, with an inverted pale V outlining the clypeus. Body dull blackish with a dull whitish dorsal line. 3rd somite with a white lateral spot. 5th to 10th somites with very short, indistinct, pale, oblique stripes. Clothed with rosettes of short brown hair, intermingled with a few longer hairs, arising from greyish warts. Spiracles white. Legs and venter black. Prolegs and anal claspers purplish.

Pupa in a loose cocoon of brownish silk. Dark purple brown, almost black. 1st to 5th abdominal somites each with a ring of orange spots. Cremaster a bunch of very short hooked spines.

Both larva and pupa are very much larger and darker than the form found in Calcutta.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 23-ix-45, spun 28-ix-45 and a female emerged 24-x-45.

Callimorpha plagiata Wlk.

Head black, the clypeus outlined with paler forming an inverted V. Body very dark nigger brown, almost black, with a silvery irridescence when looked at from certain angles. Clothed with rosettes of short, sharp, spinous, purple-brown hair growing from black warts. The hairs are sharp enough to prick the hand if the larva is carelessly handled. Spiracles black. Legs black. Venter and prolegs very dark nigger brown, almost black.

Pupa in a slight web among litter. Purplish-black, rather longer and with the intersegmental divisions rather more deeply cut than the usual Arctiid type of pupa. Cremaster two divergent tufts of longish chestnut hooked spines.

Food-plant—Ferns of various species and a variety of other low plants.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 10-x-45, pupated 23-xi-45 and a female emerged 13-xii-45.

LYMANTRIIDAE :

Pantana bicolor Wlk.

Ovum—Pale straw colour, almost spherical, the top flattened and slightly quadrate in outline, due to pressure from the ovum on either side, and with an olive line round the top edge. The micropyle a sunken dark spot. Laid in long single lines on grass-blades.

Head black and shiny. Body dark grey, a buff dorsal patch on the 1st somite. 2nd and 3rd somites with subdorsal white spots and a subdorsal buff stripe from the 4th to 11th somite. A supraspiracular whitish line and buff sub-spiracular stripe. 1st somite with a black subdorsal tubercle tufted with a pencil of long spatulate black hair. 2nd, 3rd, and 8th to 11th somites with a subdorsal series of greyish warts tufted with pale hairs, 2nd to 11th somites with a lateral and two sublateral series of similar warts. 4th to 7th somites each with a dorsal brush of golden brown hair. 11th somite with a dorsal brush of short golden brown hair and a pencil of long spatulate black hair. 12th somite with a transverse series of four warts with longish pale hairs. Dorsal glands grey. Spiracles white. Venter black. Legs and prolegs yellowish.

Cocoon spindle-shaped, of pale brown silk mixed with larval hair. Pupa pale chestnut brown, the dorsum, thorax and wing cases darker. Thorax and abdomen clothed dorsally with shortish pale hairs, the 2nd, 3rd and 4th abdominal somites with a dorsal patch of short, dense pale hair. Cremaster a short, blackish spike armed with minute hooked spines.

Food-plant—Coarse Grasses.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 5-x-45, spun 7-x-45 and a female emerged 24-x-45.

Lymantria mathura Moore.

Pupa in a slight web. Pale buff, the wing cases and venter dark brown. A blackish stripe on the thorax, expanding into a dorsal blotch on the 1st abdominal somite. Pro-thorax with a dorsal tuft of black bristles and a few pale buff bristles anteriorly on the subdorsal area, posteriorly with a few buff bristles dorsally and subdorsally. Meso-thorax with a large dorsal tuft of black bristles, and a few black and buff bristles subdorsally. Meta-thorax with a few buff bristles subdorsally. Abdominal somites with subdorsal, lateral and sublateral tufts of bristles; the subdorsal tuft on the 1st abdominal somite almost white, on the 2nd and 3rd black, on the 4th and 5th mixed black and buff, and buff thereafter, the lateral tufts on the 2nd to 4th somites mixed black and buff, the rest of the lateral and all the sublateral tufts buff. 5th abdominal somite backwards with subventral tufts of buff bristles. A few buff bristles at the side of the head. The intersegmental area laterally, anterior to the 5th and 7th somites, transversely wrinkled. Cremaster longitudinally striated and ending in a tuft of hooked spines.

Described from a pupa found at Tukdah (5,000 ft. Darjeeling Dist.) 26-ix-45, from which a male emerged 6-x-45.

Lymantria bivittata Moore.

Young larva—Head dark crimson, reticulated with yellow. Body black, the 2nd and 3rd somites transversely streaked with cream. 4th to 11th somites with traces of a white dorsal line, a subdorsal series of white dots—two per somite, and a lateral series of smaller white dots—also two per somite. 1st somite with a subdorsal red tubercle with a few rufous hairs and a small black, rufous-haired, lateral tubercle. 2nd and 3rd somites each with a transverse series of eight small brown warts with a few pale hairs. 4th to 11th somites with a subdorsal and lateral series of crimson, and a sublateral series of black warts, the subdorsal series with a few short black bristles, the lateral and sublateral with pale hairs. 12th somite with a transverse series of six warts, the centre four crimson, the outer one black, with longish pale hairs, and with fine white streaks between the warts. Dorsal glands red. Spiracles white. Venter black. Legs black. Prolegs red with an external black blotch at the base. Anal claspers red.

Penultimate instar—Very similar, but the head black reticulated with yellow. The subdorsal tubercle on the 1st somite black. The subdorsal warts on the 4th and 5th somites blue instead of crimson. The transverse cream streaks on the dorsum of the 2nd and 3rd somites absent.

Final instar-Head velvety black, the median suture and a line on each cheek pale yellow, roughly forming an inverted W. Body black, minutely speckled with white. 4th somite backwards with a subdorsal and lateral row of white dots. Subdorsal tubercle on the 1st somite black. Subdorsal warts black, except for those on the 4th and 5th somites, which are blue ringed with pale brown. The lateral series brown. All warts emitting long pale hairs, the subdorsal series with a few black bristles as well. Spiracles pale buff. Otherwise similar to earlier instars.

Pupa in a slight web among leaves. Very dark chestnut. Head, leg and antenna sheaths with a few, scattered, bright rufous hairs. Prothorax with a subdorsal, outward-curved tuft of longish black hair. Meso-thorax with a longish dorsal tuft of black, and a subdorsal tuft of bright rufous hair. Abdominal somites with a subdorsal, lateral, sublateral and ventro-lateral tuft of bright rufous hair. A few bright rufous hairs dorsally on the anterior edge of the abdominal somites in addition. Prothoracic spiracle set in a large velvety black spot. Cremaster longitudinally striated and terminating in a bunch of hooked spines.

Food-plant—*Quercus semiserrata*.

Described from a larva found at Tukdah (5,000 ft. Darjeeling Dist.) 14-x-45, pupated 18-xi-45 and a female emerged 28-xi-45.

LASIOCAMPIDAE :

Metanastria undans Wlk.

Ovum dark purple brown, minutely speckled with buff. A large unspeckled spot on either side ringed with buff, micropyle a buff-ringed dark dot, with a buff dot at the opposite end. Shape ovoid, slightly flattened on each side. The ova are laid loose, not gummed to a leaf or other support.

Described from ova laid by a female bred in Tukdah (5,000 ft. Darjeeling Dist.) in October 1945.

BOMBYCIDAE :

Prismosticta fenestrata Btlr.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xli, 76. 1939.

Amongst larvae collected at Tukdah (5,000 ft. Darjeeling Dist.) in October 1945, a certain number had the ground colour dark violet, whilst others were a bright golden ginger.

DREPANIDAE :

Macrauzata fenestraria Moore.

Head large, slightly bifid above, whitish with three faint grey transverse stripes and a black stripe on the lower part. 1st somite white. 2nd to 6th and 9th somite backwards blackish or olive brown. The posterior half of the 6th somite, the 7th and 8th very pale pinkish, with a lateral pear-shaped olive blotch. The divisions between the 6th, 7th and 8th somites very deeply cut dorsally. 6th somite with a sublateral process, something like a seal's flipper in shape, and a similar, but smaller, process on the 7th somite. 12th somite expanded slightly laterally. Anal claspers replaced by a long, thin, up-turned spine. Legs brown. Prolegs whitish. Venter blackish, whitish on the 6th to 9th somites. Rests with the head doubled back beside the body, resembling a large bird dropping.

Pupa, in captivity, formed loose at the bottom of the box, possibly amongst moss or litter in nature. Pale greenish white, the posterior half of the 3rd, the 4th and the 5th abdominal somites pinkish dorsally. Meso-thorax with a dorsal pair of black points, their base buff. Somites rather deeply cut. Covered with a white waxy powder. Cremaster very short and broad and armed with six hooked spines.

Food-plant—*Quercus lineata*.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 20-ix-45, pupated 28-ix-45 and a male emerged 10-x-45.

Albara argenticeps Warr.

Head slightly triangular, buff, the upper two-thirds spotted with darker brown. Body olive buff or pinkish buff, the abdominal somites with a series of two small pale subdorsal specks. The thoracic somites expanded laterally slightly, and with a sublateral dentate flap from the 1st to 9th somite, after which the body is much narrower. Anal somite terminating in a long pink process with the tip black. Legs and prolegs pinkish. Anal claspers absent. Venter whitish, with a dark brown lateral line. Rests with the head and forepart of the body folded back alongside the hinder part.

Pupa in a slight web of brown silk spun across a crinkled leaf. Colour old ivory, the pro-thorax dark brown, meso-thorax and wing cases suffused with chestnut, the former with a dark brown subdorsal and lateral streak, the latter veined with chestnut. Intersegmental areas, particularly between the meso-thorax, 1st, 2nd, 3rd and 4th abdominal somites, chestnut. 4th to 6th abdominal somites suffused with chestnut ventrally. Leg and antenna sheaths streaked with chestnut. Cremaster a stout spike, ending in a double spine, with two short spines on either side.

Food-plant—*Rubus* sp.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 8-x-45, pupated 14-x-45 and a female emerged 29-x-45.

SPHINGIDAE :

Macroglossum aquila Bsd.

4th (penultimate) instar—Head bright green. Body bright green, dotted with yellowish along the secondary segmental divisions. Thoracic somites with a dark green subdorsal stripe edged below with yellowish. A dark green dorsal line. Lateral area with seven oblique dark green stripes, the last reaching the base of the horn, these are crossed by a further seven narrower green stripes, forming a series of dark green edged diamonds. Horn purplish with minute black warts, the apical third pure yellow. Legs green. Prolegs green with a transverse purple-brown band. Spiracles black.

Final instar—Head green with a pale lateral stripe edged on each side by darker green. Body bright green speckled along the secondary segmental divisions with yellow. Thoracic somites with a black subdorsal line, edged below broadly with yellow. A dorsal line, bright green from 2nd to 5th somite, black from 6th somite to base of horn. A subdorsal zigzag bright green line from 4th to 10th somite, the lower angle of the zigzag marked with a black dot and meeting the oblique lateral stripes on 5th to 10th somites. 3rd somite with a short oblique black lateral streak. 5th to 9th somites with oblique, plum-coloured, lateral stripes, which terminate on the somite behind, the stripe on the 9th somite continued to the base of the horn, the continuation black. A blackish dorsal stripe from base of horn to the apex of the anal flap. Spiracles black, very narrowly outlined with white and then edged on each side with blackish. Horn black, minutely tuberculate, the apical quarter bright yellow. Legs pink, the basal segment black. Prolegs green with a maroon basal stripe, a black median and a chestnut apical one. Venter green, a series of dark maroon, ventro-lateral blotches on the anterior part of each somite from the 5th backwards, a V-shaped, dark maroon, ventral mark from the 5th to 9th somite, thereafter wholly maroon.

Pupa in a slight web amongst litter. Old ivory colour, the head, thorax and wing cases tinged with green. Abdomen minutely speckled with black. A black dorsal line, well defined on the thorax, diffuse on the abdomen. A black mark at the base of the wing case on the pro- and meso-thorax, a black streak along the inner margin of the wing case from the 1st to 3rd abdominal somite. Spiracles set in black patches. A black line between the wing cases ventrally, and a lateral blackish stripe on the abdomen. The anterior edge of the 5th abdominal somite highly punctate and blackish in colour. Cremaster long, black and shining, the tip bifid. Proboscis sheath projecting slightly frontally and ventrally.

Described from a larva found at Tukdah (5,000 ft. Darjeeling Dist.) 2-x-45, pupated 15-x-45 and a male emerged 13-xi-45.

Macroglossum pyrrhosticta Btlr., *pyrrhosticta.*

Butler, *Trans. Zool. Soc. Lond.,* ix, 527, pl. xc, fig. 8. 1877.

Mell, *Biol. u. System. der Sudchin. Sphing.,* 258, pl. 18, fig. 24, pl. 30, fig. 11. 1922.

Seitz, *Seitz Indo-Austr. Bombyces,* x, 557. 1929.

Bell & Scott, *Fauna Brit. Ind.,* Moths, v, 371, pl. xi, figs. 13, 14, pl. xv, fig. 4. 1937.

Head olive brown, a dark central and lateral stripe, the latter edged below with yellowish in continuation of the subdorsal body line. Body with the dorsum olive brown speckled with pinkish along the secondary segmental divisions. An olive brown dorsal and subdorsal line from head to base of horn, the latter line edged below with yellowish on the thoracic somites. The area below the subdorsal line less speckled, and therefore appearing more olive brown, and with a series of eight oblique olive brown lateral stripes. Legs pink, the basal joint black. Prolegs purplish with a black basal line. Horn straight, dark purplish, the tip deep yellow, and covered with minute black points. Anal flap edged with yellow. Spiracles bright chestnut, the ends white.

Pupa in a slight cocoon spun among litter. Thorax and wing cases bone coloured, the wing cases streaked with smoky. Abdomen pinkish. A black dorsal line, clearly defined on the thorax but indistinct on the abdomen, and a black line ventrally between the wing cases. Spiracles set in black spots. A black line on the inner edge of the wing case from the 1st to 3rd abdominal somite. Abdominal somites ventrally with an indistinct black median line, a series of indistinct black spots sub-medianly and a blackish ventro-lateral stripe. Proboscis sheath projecting frontally and ventrally. Cremaster dark brown, shading into black apically, very shiny, and ending in two short, stout spines, excavate below, the sides slightly curved.

Food-plant—*Paederia foetida* Linn. (Rubiaceae).

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 20-ix-45, pupated 24-ix-45 and a male emerged 19-x-45.

Seitz' description is 'Larva green or brown, the green form similar to the larva of *stellatarum* with a long, pointed, rather straight horn and a light, dark-shaded subdorsal line below which there are long, narrow oblique shadows.' Bell & Scott describe and figure the green form only, which I did not meet with, and only mention seven oblique lateral stripes. My larvae, however, had a distinct stripe on the 3rd somite, this is omitted in Bell & Scott's figure.

Macroglossum troglodytus Bsd.

Hamps., *Fauna Brit. Ind.*, Moths, i, 117, fig. 64. 1892 (as *gilia*).
Hamps., *Ill. Het.*, ix, 59, pl. 175, fig. 6. 1893 (as *gilia*).
Mell, *Biol. u. System der Sudchin. Sphing.*, 261, pl. 9, figs. 6, 7, pl. 18, figs. 36, 37. 1922.
Seitz, *Seitz Indo-Austr. Bombyces*, x, 558. 1929.
Bell & Scott, *Fauna Brit. Ind.*, Moths, v, 373, pl. xv, fig. 5. 1937.

Ovum—Small, pale green, almost spherical. Laid singly on the underside of a leaf of the food-plant, usually near the edge.

1st instar—Head round, yellow green. Body yellow green, becoming greener after feeding. Horn black, erect, fairly stout, the tip bifid.

2nd instar—Similar.

3rd instar—Head yellow green, with a pale lateral stripe. Body green, a white subdorsal line, the area between somewhat bluer, and a darker blue-green dorsal line. Horn dull purplish, with minute black tubercles, the tip black. Larvae reared in captivity often have the subdorsal line edged above with olive green and with a lateral series of eight oblique olive green stripes.

4th instar—Head yellow green, with a central darker green line and a dark green line edged below with whitish in continuation of the subdorsal body line. Body yellow green, minutely speckled with white along the secondary segmental divisions on the area between the subdorsal lines. A bright green dorsal line and a bright green subdorsal line edged below with whitish from the head to the base of the horn. The area below rather brighter green, with a few minute white dots, and with traces of eight oblique dark stripes. Horn with the basal third pale purplish, the rest whitish green, and sprinkled with minute black specks. Legs pale green. Prolegs pale green, the feet pink. Spiracles white with an orange bar across the middle. This is the usual wild form. Another 4th instar larva found wild was greenish yellow, with the dark markings olive, the horn dark purple, rather paler basally, with a yellow tip.

Final instar—Very similar to the preceding, but the colour brighter, the dark dorsal line edged indistinctly with white and the subdorsal with yellow, most noticeably on the thoracic somites and from the 10th somite to the base of the horn. Legs reddish, the basal joint black. Prolegs deep pink with a black basal line. Horn with the basal half bluish above and below, violet at the sides, the apical half greenish yellow, the whole studded with minute black points. This is the usual wild form.

Dark form—Head dark brownish olive, with a pale lateral stripe. Body yellowish buff, striped along the secondary segmental rings with brown and dotted with white, particularly on the dorsum. A dark brown dorsal line, edged with paler, and a dark brown subdorsal stripe, edged below with yellowish. Lateral area greenish, the oblique stripes brown. Venter dark olive brown. Legs orange, the base black. Prolegs dark red, the base black. Horn very deep blue, the tip yellow.

When reared in captivity a very dark form appears in the 4th and final instars. This has the head dark olive brown with a paler lateral line that joins the subdorsal body stripe. Body very dark olive brown, minutely speckled with bluish. An orange brown subdorsal stripe, broken up into short bars on the abdominal somites and forming a series of V-shaped marks in conjunction with the oblique lateral stripes. Sublateral and ventral area more tinged with olive. Horn black, the tip yellow. Legs orange, the base black. Prolegs blackish, the feet purplish with a pale band. Spiracles pale yellow with a central, transverse, red-brown band. Another even darker form is without the oblique lateral stripes and the subdorsal stripe is obsolete except on the thoracic and 11th somites. The wild, dark form (see above) also appears, sometimes with the ground colour olive, sometimes pure green, as well as intergrades of all degrees.

The larvae are very heavily attacked by parasites, very few adult larvae were found wild and all those, some twenty or more, found in the 2nd, 3rd and 4th instars were ichneumoned, the parasites emerging just before the moult into the last instar and spinning their white cocoons attached to the dying host by one end.

Pupa in a slight cocoon amongst litter. Pinkish bone colour, a black dorsal line on the thorax, which become diffused and greenish on the abdomen. A black ventral line between the wing cases, the latter with minute black marks along the veins, and with a black streak along the inner margin to the tornus. Spiracles set in black patches. Venter with a blackish lateral stripe consisting of conjoined blackish patches. Cremaster brownish black, very shiny, the sides straight and tapering, the apex terminating in two blunt teeth.

Food-plant—*Hedyotis* sp. (Rubiaceae).

Described from larvae found at Tukdah (5,000 ft. Darjeeling Dist.) one of which pupated 28-ix-45 and a male emerged 24-x-45.

Seitz' description is 'Larva with a white apex of the horn, quite similar to the preceding and following species (*pyrrhosticta* Btlr. and *poecilium* R. & J.), sometimes green and sometimes brown.' Hampson's description in the *Illustrations* is 'Adult larva bright green; a pale medio-dorsal stripe with brownish median line; a pale dorsolateral stripe, edged above with reddish brown, the space between this and the medio-dorsal stripe speckled with minute brownish spots; stigmata black; 8-9 brownish diagonal stripes alternating with the spiracles; below the medio-dorsal line minutely speckled with white;. horn black, with yellow tips (sic). Legs pink; claspers brownish. There is a paler variety of the larva in which the red-brown markings are replaced by olive-green.' The description in the *Fauna* appears to have been based on this. Bell & Scott again.

as in the description of the previous species, only mention seven oblique stripes and their figure, a photograph, certainly only shews seven. My larvae, however, all shewed a more or less noticeable stripe on the 3rd somite, and Hampson's figure shews a short stripe on the 2nd in addition.

Rhagastis albomarginatus Roths., *albomarginatus*.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 416. 1946.

Bell & Scott (*Fauna Brit. Ind.*, Moths, v, 480) state that the larvae of this species are singularly free from the attacks of parasitic wasps and flies. At least 30% of the larvae found at Tukdah (5,000 ft. Darjeeling Dist.) in September and October 1945 were infested with a fairly large Dipterous parasite, the larvae emerging from the host pupa some two to three weeks after it had been formed.

NOTODONTIDAE :

Somera viridifusca Wlk.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 418. 1946.

Among a number of larvae found at Tukdah (5,000 ft. Darjeeling Dist.) in November 1945, one had large cherry-red spots contained in the subdorsal line on each somite from the 2nd to the 12th. Another had the spots reduced to streaks against the upper edge of the subdorsal line on somites 3 to 12, the streak on the 7th somite rather thicker.

CYMATOPHORIDAE :

Thyatira batis L.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xl, 684. 1939.

Young larva—Similar in shape to the adult. Colour usually olive green, the dorsum of the 2nd and 3rd somites rather yellower. Head brownish orange. Legs black. More rarely like the adult.

Another form of the adult larva is a rather pale purple brown, a blackish sublateral stripe from the 4th somite backwards. A blackish dorsal spot on the 4th somite and an oblique darker lateral stripe starting from a blackish subdorsal spot. The apices of the humps on the 5th to 9th somites black, forming the apex of a roughly triangular dark lateral mark. 11th somite with a blackish dorsal blotch and a subdorsal blackish spot.

Described from larvae found at Tukdah (5,000 ft. Darjeeling Dist.) in October 1945.

NOCTUIDAE :

Conservula indica Moore.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 421. 1946.

Green form—Head pale green. Body bright yellow green speckled with whitish. An interrupted white dorsal line and a white subdorsal line, straight on the 1st and 2nd somites and becoming a series of oblique streaks from the 3rd to the 12th, these streaks edged above with darker green, the darker green areas containing a white speck. A white sublateral line. Spiracles white rimmed with black. Legs and prolegs pale green. Venter pale green speckled with whitish. Anal flap with a dorsal and subdorsal white line.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 13-xi-45, buried itself 18-xi-45 and a female emerged 8-xii-45.

Eriopus (*Callopistria*) *repleta* Wlk.

Head yellowish green, a blackish curved line on either side of the clypeus forming a rough, inverted U, and a blackish line on the cheek. Body yellowish green. 1st somite with a transverse olive green bar and a transverse black line behind it. A broad transverse olive green bar on the dorsum of each somite from the 2nd to 11th, straight in front and slightly curved behind. An olive green subspiracular stripe, straight on the thoracic somites and zigzag thereafter, which joins the transverse bar on the 1st somite and which is continued across the 12th somite as a transverse bar. Spiracles black. Venter, legs and prolegs yellowish green.

Pupa in a slight, earth-covered cocoon, spun, in captivity, under moss but on the surface of the soil. Very dark reddish chestnut, a dorsal stripe and the intersegmental areas of the abdomen darker. Wing cases tinged with olive. Cremaster a double spine.

Food-plant—Ferns of various species.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 17-ix-45, pupated 24-ix-45 and a male emerged 13-x-45.

Risoba basalis Moore.

Penultimate instar—Head yellow green. Body pale green, a broad white subdorsal stripe, with white speckling below it and a single white dot on the thoracic and two on the abdominal somites above. An indistinct pale lateral line with slight white speckling below. Legs almost colourless. Venter and prolegs paler green.

Final instar—Very similar, except that the subdorsal stripe is tinged with pink, the whole of the area between being sometimes suffused with this colour. There is also a pink stripe on the head in continuation of the subdorsal body stripe. One larva was entirely suffused with crimson.

Cocoon long and slender, in captivity spun along a stem of the food-plant. Of brownish silk, into which hairs from the food-plant are worked. Pupa chestnut brown, the head and pro-thorax and a dorsal line on the abdomen suffused with purplish. Wing cases tinged with greenish, abdomen ventrally with yellow. Shape long and slender, 7th abdominal somite with a transverse, raised, dentate, dorsal ridge. Proboscis sheath projecting beyond the wing cases and reaching almost to the end of the abdomen. Cremaster bluntly triangular.

Food-plant—*Melastoma* sp. *Osbeckia* sp.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 19-ix-45, spun 23-ix-45 and a male emerged 14-x-45. Most of my larvae spun and then entered a diapause, eventually dying and drying up.

Carea nitida Hamps.

Head yellowish. Body white, minutely speckled with green so that the general colour appears to be green. An H-shaped mark formed of white dots stretching over the dorsum of the 4th to 6th somites. A sublateral line, whitish on the thoracic somites and yellowish thereafter. Venter, legs and prolegs yellowish green. The thoracic somites are swollen up into a large balloon. One example had the ground colour very pale mauve, the speckling darker mauve.

Cocoon spun along a twig, of dark red-brown silk. In profile, the shape roughly triangular, the short side at the front and surmounted by a tuft of silk. A frontal slit for the emergence of the imago. Empty pupa skin pale brown. The apex of the abdomen rounded and without any actual cremaster.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 18-ix-45, spun 21-ix-45 and a female emerged 9-x-45.

Cosmophila fulvida Guen.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xli, 80. 1939.

A number of larvae collected in the penultimate instar at Tukdah (5,000 ft. Darjeeling Dist.) in October 1945, all assumed a dark olive brown coloration after moulting. The markings and the red vertex of the head as in the normal form.

Phytometra (*Plusia*) *orichalcea* F.

Moore, *Lep. Ceyl.*, iii, 70. 1884-87.
Hamps., *Fauna Brit. Ind.*, Moths, ii, 573. 1894.
Hamps., *Cat. Lep. Phal.*, xiii, 580. 1913.
Gardner, *Indian Forest Records*, vi, 286. 1941.

Head green, the mouthparts and a broad lateral stripe black. Body bright yellow green, a darker green dorsal stripe, edged with an irregular yellowish line from the 3rd somite backwards, two dorsolateral waved yellowish lines and a lateral yellowish line, edged above indistinctly with darker green. The area below the lateral line dotted sparsely with white. 1st somite with a double, 2nd and 3rd with a single, transverse series of eight minute black specks emitting longish white bristles, 2nd and 3rd somites with an additional sublateral pair and a speck at the base of each leg. 4th to 10th somites each with an inner anterior and outer posterior subdorsal black speck, three lateral and three ventro-lateral, an additional speck at the base of each proleg. 11th somite, which is slightly humped, with two subdorsal, one lateral and three sublateral specks. 12th somite with two subdorsal and one lateral. Anal flap with a transverse series of four. Spiracles white ringed with black. Legs black. Prolegs black, the first two pairs obsolete. One example had the specks, except for the lateral series, yellow and the prolegs green instead of black, and another had the specks on the 12th somite and the ventro-lateral series white.

Pupa in a cocoon of white silk spun in a leaf. Dull olive black, the intersegmental areas of the abdomen dull olive green. Antenna and leg sheaths outlined with olive, the antenna sheath projecting slightly beyond the wingcases. The cremaster spade-shaped, and armed with hooked spines, which are attached to the inside of the cocoon.

Food-plant—Garden Geranium.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 22-ix-45, pupated 25-ix-45 and a male emerged 8-x-45.

Moore's description, which is copied more or less by Hampson, is as follows:—' Larva bluish-green, with a few short dorsal hairs; a prominent white lateral line, and slender dorsal lines. Pupa olive-green beneath, dorsally purplish-brown; stigmata black. Feeds on Coreopsis. '

Dichromia quadralis Wlk.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 423. 1946.

Some larvae found at Tukdah (5,000 ft. Darjeeling Dist.) in November 1945 were suffused with black to such an extent that they appeared to be blackish larvae with an interrupted yellowish subdorsal and spiracular stripe, and with the intersegmental areas yellowish dorsally, particularly between somites 3, 4, 5, 6, 7, 10, 11 and 12. The head with the lower half suffused with blackish, the upper half dull olive. Black spots as in the pale form.

GEOMETRIDAE:

Tanaorrhinus vittata Moore.

Pupa in a slight cocoon in a curled leaf. Ground colour ivory white, the abdomen streaked minutely with the palest pink, thorax and abdomen with minute black specks. Spiracles black. Cremaster bluntly spade-shaped, armed with minute hooked spines on the margin, which are fixed in the silk of the cocoon.

Food-plant—Probably *Quercus* sp., as the pupa was found in an oak leaf.

Described from a pupa found at Tukdah (5,000 ft. Darjeeling Dist.) 28-ix-45, from which a female emerged 7-x-45.

Comibaena subhyalina Warr.

Head dull, dark brown, with a subdorsal greyish stripe. Body dark greyish brown, a darker dorsal and lateral stripe. 4th to 8th and 11th somite each with a long subdorsal process, to which the larva attaches pieces of leaf. Venter with a broad greyish central stripe on the abdominal somites. Legs dark brown. Proleg and anal claspers greyish brown. Rests in an arched position and moves in a series of jerks. Not very difficult to detect as many of the pieces of leaf are usually dead and brown.

Pupa in a net-like cocoon covered with the pieces of leaf previously attached to the larva. Dull, dark nigger brown, minutely speckled with paler brown. A double, dark brown, dorsal line and a subdorsal series of dark brown spots. Wing cases with the veins marked with dark brown. A slight tubercle behind the pro-thoracic spiracle. Cremaster a blunt spike armed with minute hooked spines at the apex and attached to the silk of the cocoon.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 28-x-45, pupated 10-xi-45 and a female emerged 24-xi-45.

Calothysanis (*Timandra*) *correspondens* Hamps.

Pupa long and slender, the head produced into a longish downcurved beak with bifid tip. The thorax very slightly keeled, the wing cases slightly angled. Colour golden brown, suffused with darker and minutely speckled with black. A white line along the thoracic keel, a spiracular dark brown stripe. Wing cases suffused and streaked with darker brown and with a white disco-cellular dot. Cremaster a blunt point armed with small hooked spines and attached to the web containing the pupa.

Described from a pupa found at Tukdah (5,000 ft. Darjeeling Dist.) 22-ix-45, from which a female emerged 25-ix-45.

Anisodes obrinaria Guen.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlii, 756. 1941.

Head rounded, yellowish green. Body bright green. 8th somite with a blackish-brown, pear-shaped, dorsal mark. 11th somite with a blackish-brown, triangular, dorsal mark, which extends to the anal flap. Body sprinkled with minute black specks, giving rise to single, short, brown bristles. Legs yellowish. Proleg and anal claspers yellowish green.

Pupa suspended by a girdle and tail pad of white silk from the underside of a leaf. Bright green. The thorax and head frontally flattened and projecting forward on each side in a sharp point. A broad stripe from the tip of the point across the front of the thorax dark brown. Abdominal somites with a dark red-brown dorsal line, which expands into a small diamond on the 2nd abdominal somite and into a round spot on the 5th, the line almost obsolete on the somites between. In some pupae the dorsal markings are obsolete, except on the last somite. A black speck on the edge of the wing case and on the 3rd abdominal somite.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 21-ix-45, pupated 24-ix-45 and a female emerged 1-x-45.

Cidaria obfuscata Warr.

Head yellowish brown, with short black bristles. Body bright green, a darker green dorsal stripe and a white lateral line. 8th somite with a short, longitudinal, black, dorsal bar. Spiracles black. Legs yellowish brown. Venter and proleg bright green.

Pupa in a slight cocoon spun in a leaf. Bright green, the dorsum somewhat bluer and speckled minutely on the abdominal somites with dark red. Spiracles brown and raised. Cremaster a dark brown, stout spike, armed with minute hooked spines and fixed in the silk of the cocoon.

Food-plant—*Impatiens* spp.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 19-ix-45, pupated 23-ix-45 and a male emerged 2-x-45.

Phthonoloba decussata Moore.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 426. 1946.

The larva varies considerably in colour, matching the leaves on which it is feeding. A larva found on the young foliage of orange had the head pale yellowish green with a black line across the vertex joining the lateral body stripe. Body yellow green, a pinkish lateral line on the thoracic somites. A very faint yellowish spiracular line. Spiracles brown. Venter, legs and proleg yellow green. On rose, one specimen had the head pale, the body deep crimson. Venter whitish. Legs pink. Proleg and anal clasper crimson. Another was green tinged with bronze, with a crimson dorsal and lateral stripe. A third had the head and body green, the venter somewhat glaucous, with a crimson lateral line edged above with yellow. A fourth had an indistinct crimson dorsal line, the points of the anal claspers crimson, and a brown line round the head joining the yellow-edged crimson lateral line.

Food-plants—In addition to Rose, found on *Citrus* sp., Apple and a forest shrub.

Described from full fed larvae found at Tukdah (5,000 ft. Darjeeling Dist.) in September and October 1945.

Garaeus specularis Moore.

Head golden brown, the clypeus blackish, a pale streak on either side of it terminating in a white spot; the antennae very long and projecting forwards. Body mottled, dark coffee-brown, with traces of a blackish dorsal line. 7th somite with a subdorsal, enamel-white dot anteriorly. 6th somite with a greyish dorsal streak. 2nd somite with a projecting subdorsal fleshy process, 11th somite with a double dorsal wart. Legs purplish brown. Venter, proleg and anal claspers mottled, dark coffee-brown.

Pupa, in captivity, under a leaf spun to the bottom of the box. Olive brown, the thorax, wing cases, leg and antenna sheaths olive. Cremaster a blunt triangle covered with hooked spines, the somite before with a transverse dentate dorsal ridge.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 26-ix-45, spun 4-x-45 and a female emerged 21-x-45.

Leptomiza calcearia Wlk.

Head pale buff, the upper half blackish. Body olive brown, under a lens speckled with darker. 5th somite with a sublateral, downward-pointing, fleshy, thorn-like, reddish brown process. 6th, 7th and 8th somites with similar lateral but upward-pointing processes. Legs yellowish. Venter, proleg and anal claspers olive brown. Shape very long and slender, resting position usually hanging, straight, the head and first somite thrown back, the 2nd pair of legs extended. When small very much resembles a dead, broken leaf-stalk of the food-plant.

Pupa in a spun together leaf. Deep chestnut, the head, thorax and wing cases dark olive. Very shiny. Cremaster a pair of hooked spines attached to the silk lining of the leaf.

Food-plant—*Rubus* sp.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 6-xi-45, pupated 11-xi-45 and a female emerged 22-xi-45.

Fascellina plagiata Wlk.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 429. 1946.

Another larva was much duller in colour. Head blackish, outlined with grey. Body grey, speckled minutely with darker. Thoracic somites with a broad, dark grey, dorsal stripe, continued on the 4th somite as a broad, coffee-brown stripe, edged indistinctly with lavender. The dorsum of the 5th and 6th somites slightly suffused with lavender. 8th somite with a yellow, heart-shaped, dorsal mark. A dorsal stripe from the 8th somite to the anal flap, brown on either side of the yellow mark, then purple grey, with a blackish subdorsal mark in it on the 9th somite, 11th somite slightly humped, the stripe on the hump bright golden brown, and then dark nigger brown to the apex of the anal flap. The lateral area from the 8th somite backwards and a wedge-shaped mark running forward to the 7th somite suffused with lavender. Venter grey with a blackish median line, this is divided from the 7th somite to the proleg, enclosing a white streak with a central yellow line. 5th somite with the toothed dorsal process ending in a bifid fawn point, the dorsal hump on the 6th somite also ending in a bifid buff point. The larva rested with the body hanging almost vertically from the proleg and anal claspers, the head thrown back and the third pair of legs extended, the irregular outline giving it the appearance of a twisted dead leaf.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 30-ix-45.

Luxiaria obliquata Moore.

Head rounded, olive green minutely speckled with darker. Body darker olive green minutely streaked and speckled with reddish, but with no other distinguishing markings. Venter rather greener. Legs, proleg and anal claspers olive green. Spiracles brown ringed with black.

Pupa subterranean. Very dark purple brown, the wing cases slightly tinged with olive, the intersegmental areas paler. Shape slender. Cremaster a stout point with a bunch of hooked spines at the tip.

Food-plant—*Melastoma normale* Don.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 22-x-45, buried itself 24-x-45 and a female emerged 13-xi-45.

Thinopteryx crocoptera Koll.

Head pale buff, slightly indented above. Body rich reddish brown, a small quadrate dorsal spot on the 4th somite, 5th to 10th somites each with two pairs of subdorsal black specks. 5th somite with a slight white subdorsal frosting anteriorly. A raised whitish-buff line from the base of the proleg to the 11th somite, where it joins a similar transverse line. Legs pale buff. Venter pale buff to the base of the third pair of legs, greyish on 4th and 5th somites and greenish buff from 6th somite to the proleg. Proleg, anal claspers and anal flap pale buff. Shape short and stout, the third somite swollen somewhat laterally. Some larvae are suffused with greenish.

Pupa in a spun together leaf. Dark purple brown, the wing cases very dark green. Shape long, the wing cases encroaching on the dorsum so that only a comparatively narrow strip of the abdomen is visible between them. The intersegmental area between the 4th and 5th abdominal somites very broad. Cremaster stoutly triangular, ending in two out-curved spines with a number of shorter hooked spines on either side.

Food-plant—Vine, Virginia Creeper.

Described from a full fed larva found at Tukdah (5,000 ft. Darjeeling Dist.) 19-ix-45, pupated 3-x-45 and a male emerged 17-x-45.

(*To be continued*).

THE ISLET:

A BIRD SANCTUARY IN CEYLON

BY

W. W. A. PHILLIPS

(*With* 6 *plates*)

Away down in the jungles of the North Central Province of Ceylon, there lies a beautiful forest-girt irrigation reservoir, built hundreds of years ago by the ancient Sinhalese to provide water for their paddy-fields. This reservoir, or 'tank' as it is invariably called in Ceylon, has now been proclaimed a Bird Sanctuary, for the better protection of the beneficial birds of the district. Quite rightly so, for it is an ideal home for all those species that find congenial haunts in the vicinity of fresh-water lakes and lagoons, surrounded by forest and swamp—the graceful egrets, the dignified storks, the gaunt herons, the noisy plover, the busy sandpipers and multitudes of other species.

This lovely spot—beautiful both by daylight and by moonlight and most beautiful of all on a peaceful evening as the sun sinks behind a jungle-covered ridge of low hills to the west, its dying rays piercing the lingering clouds and lighting up, with a warm glow, the still, placid waters—has always held for me a deep attraction. It has become a favourite camping ground of mine for, in addition to the swamp at the far end where the marshy stream brings in the waters of the north-east monsoon rains and its forest-girt shores that always give shelter to much interesting Wild Life, there is a most attractive islet rising above the surface, over towards the western shore.

Just a small mound of shingle, sand and boulders, little more than a hundred and fifty yards across, this islet is covered with grass and scanty scrub, when the water is low, and has a shallow, sloping, sandy beach, beloved of crocodiles and wading birds.

When flood waters in the tank are spilling over, however, it sinks beneath the surface—to rise again, washed and fertilised, ready for the springing up of fresh vegetation, as soon as the level once again recedes, through evaporation and the draining off of the life-giving water to irrigate the villagers' paddy-fields. It then becomes a veritable sanctuary for the swarming bird-life, the crocodiles and the terrapins; sometimes its shores are black with cormorants, shags and darters, with crocodiles and terrapins scattered about, like logs and stones, close—but *not* too close—to them and egrets, herons, open-billed and white-necked storks and many lesser species, wading in the shallows nearby. As the water recedes still further and the green herbage begins to scorch and wither in the fierce heat of the June sun, the islet welcomes back its 'Summer Boarders'. They arrive one after the other, as soon as a bare acre or so of breeding space is available. Immediately upon arrival, the various species set about their domestic duties. Time is short, for they must hatch out their eggs and launch their young into the avian world before the tank dries up so drastically that the islet becomes once more wedded to the mainland and the water ceases to form a barrier to the inroads of jackals and jungle cats that prowl throughout the night, seeking the unwary birds and their young.

Generally, the first to arrive are the stilts—the local race of the Black-winged Stilt (*Himantopus h. ceylonensis*)—noisy, rather quaint birds, with their over-long, bright pink legs and their shrill aggravating alarm cries, wherewith they awake the neighbourhood whenever they find anything that invites their curiosity or suspicion. Domestic duties permitting, they spend their days wading in the shallows, often up to the full length of their long, spindly legs, seeking minute insects and crustaceans. Nine, possibly ten pairs nested on the islet in June 1939—not laying in a colony, but scattering their meagre nests (of pebbles and water-weeds, straw and shells) amongst the sparse, sun-scorched herbage and rocks, never more than forty feet or so from the water's edge. Amusing birds to watch, they are not over-suspicious of a hide; unless they glimpse the unwinking eye of the camera-lens gazing steadfastly upon them,

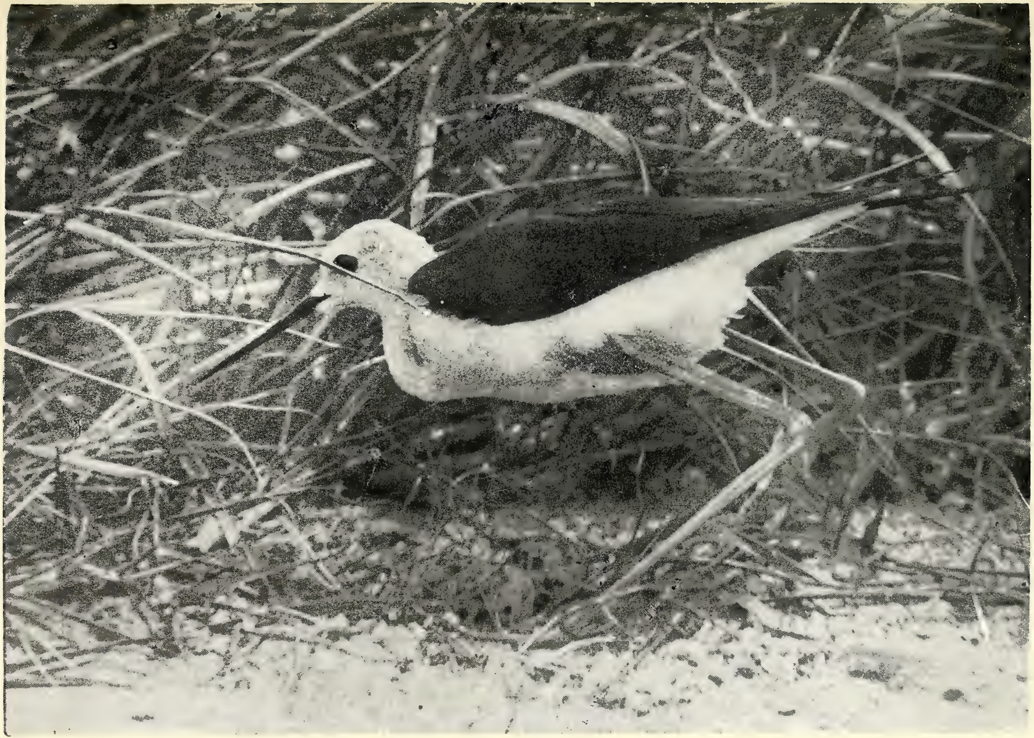


Photo by *W. W. A. Phillips.*

Ceylon Black-winged Stilt about to settle on eggs.

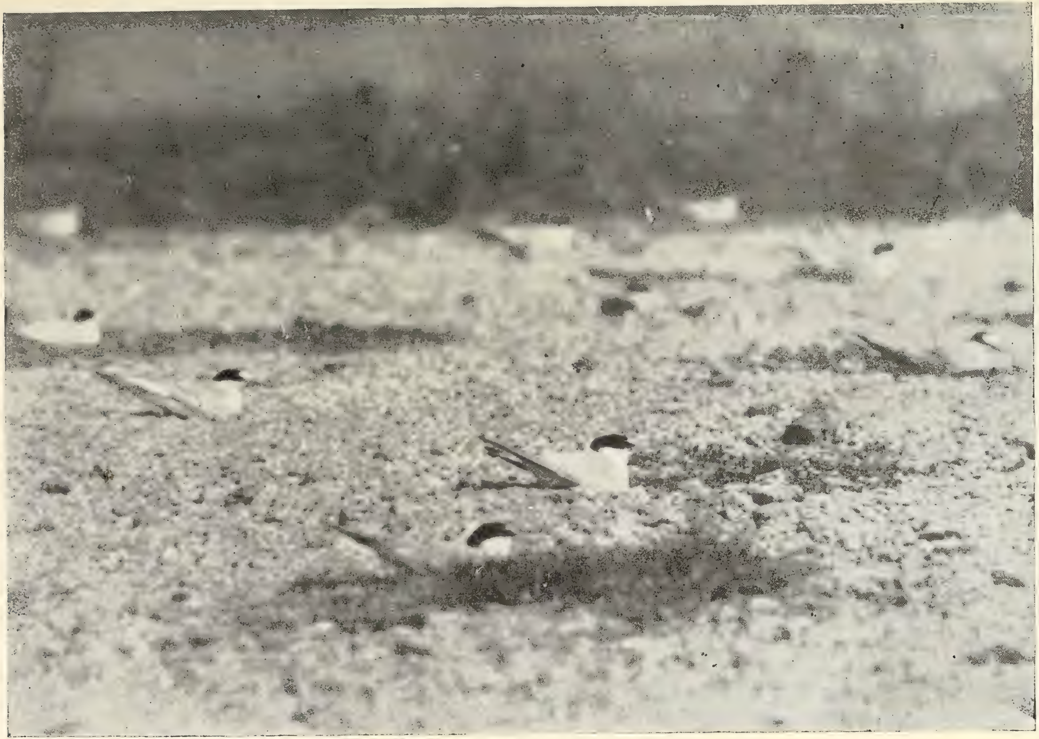


Photo by *W. W. A. Phillips*

White-shafted Little Terns on eggs all facing the prevailing wind.

they settle down quickly upon their eggs, to protect them from marauders and the baking rays of the sun. As they double up their long legs and settle down with their knee-joints projecting out behind them, they remind one of miniature camels, doubling up to rest! A large colony of White-shafted Little Terns (*Sterna albifrons sinensis*) sometimes joins the summer boarders on the islet; they are erratic however and do *not* always put in an appearance. Presumably, they come here only when conditions in their regular nesting haunts, on neighbouring tanks, are unfavourable. They are sociable but extremely noisy birds; they do *not* object to other species nesting close to them, nor to their own species laying close alongside, so we find many eggs (in pairs or more rarely in threes) in bare scrapes in the sand or gravel of our little islet—so many indeed that care must be exercised to avoid crushing them underfoot. It is a pity that the Little Terns—in fact almost all terns—have such unpleasantly shrill, raucous voices. They are most graceful and attractive birds to watch, wheeling and swooping in the air, turning somersaults and diving into the water after wee small fish or sitting quietly brooding their eggs—but their shrill screams, when approached, add nothing to their attractions.

Amongst the terns, one or two plovers often have their nests—the Red-wattled Lapwing (*Lobivanellus indicus indicus*), the Ceylon Kentish Plover (*Leucopolius alexandrinus leggei*) or Jerdon's Little Ringed-Plover (*Charadrius dubius jerdoni*), with its large yellow-ringed eyes. Not always do these plovers seek the safety of the islet sanctuary, for I have frequently found them nesting on a little gravel spit on the neighbouring shore—a little spit formed by the jutting out of a low ridge of rocks—but there is generally a nest or two on the islet. The Little Terns, like the majority of birds that nest in colonies, are easy to photograph from a hide, pitched nearby their nests. As soon as we are comfortably tucked in and our assistant has moved off in the canoe, or has waded to the shore, back come the terns to their nests, quickly settling themselves down, all facing the prevailing wind, to resume the incubation of their treasures. They take little notice of the hide or the release of the shutter, and ignore any slight movement or noise. Having seen a man leave in the canoe, it apparently never occurs to them that another human being could possibly have remained behind in concealment!

But of all the summer boarders of the islet, to me at least, the most interesting are the Great Stone-Plovers (*Esacus recurvirostris*), a pair of which nest annually on the islet. There is just one pair—never more—as these fine birds appear to have each its own territory for breeding purposes and to be impatient of the close approach of others of their own species on their secluded nesting haunts.

It was on this islet that first I made the close acquaintance of this bird and, although I have met with many others since, both along remote sea-beaches and on some of our larger, inland irrigation tanks, it is always with this islet that I associate these birds. Here it was that I obtained my best photographs and here it is that I always look forward to renewing my acquaintance with one of our finest-waders.

In my apprentice days, I was thrilled, one memorable week-end, to find a lovely pair of eggs, laid in a shallow depression amongst the sun-scorched vegetation, one day in August. From the shore I had seen the birds and had deemed it worthwhile to wade across, scaring the crocodiles from our path by beating the water with sticks as we approached. The stone plovers had cried their protests as we landed and had departed to the further shore, leaving us to search almost the whole of the islet before we discovered the eggs. Being without great knowledge of the art of bird photography, I hastily erected my hide, some eight feet away, roughly camouflaged it with dead grass-stalks and scrubby brushwood, entered and focussed up the camera, was tucked in and sent my assistant wading back to the shore—there to wait in the jungle until summoned by my whistle to return to let me out.

Within half an hour, the stone plovers returned and one approached the nest—but it was terribly suspicious and suddenly catching sight of the eye of the lens, peering from the face of the sacking-hide, it fled precipitately, much to my disappointment. Another very cautious approach and a similar headlong retreat—then a black crow (*Corvus macrorhynchus culminatus*), that bane of all bird-photographers, turned up and took part in the proceedings. Flying close overhead, he had spied the uncovered eggs and alighted to make a meal of them—immediately the stone plovers sailed into the attack, forgetting their nervousness of the hide. Now an avian-battle raged above my head, the crow attempting to reach the eggs and the stone plovers trying to drive him from the vicinity. After nearly fifteen minutes of continuous skirmishing, the crow gave up and, with many caws of disgust, flapped off across the tank. The stone plover once again approached and this time reached her eggs. But it was quite obvious that she was still very ill at ease, so, after making two exposures, I called it a day, summoned my assistant and waded back to the shore.

The next morning the stone plovers were not nearly so nervous and I found it easier to make a series of exposures—some fairly good but mostly of not much use owing to overeagerness. Later I was to find that the Great Stone Plover is one of the more difficult ground-nesting birds of which to make satisfactory pictures—it always seems nervous and on the alert.

On subsequent visits to the islet, I found the hatchlings; perky stone-grey little chicks, with dark interrupted markings and also the large young, still unable to fly. Run, they could—with great speed—but there was no space for racing on the tiny islet so they were forced to squat, with necks outstretched along the ground, and trust to their obliterative colouring to escape detection—which they probably would have done except in a confined space like our islet.

These attractive stone plovers are still plentiful in our wildest coastal tracts and there are generally several pairs around the shores of our larger tanks. During the nesting season, when the water level is low, stretches of shallow beaches, gravel banks and rocky

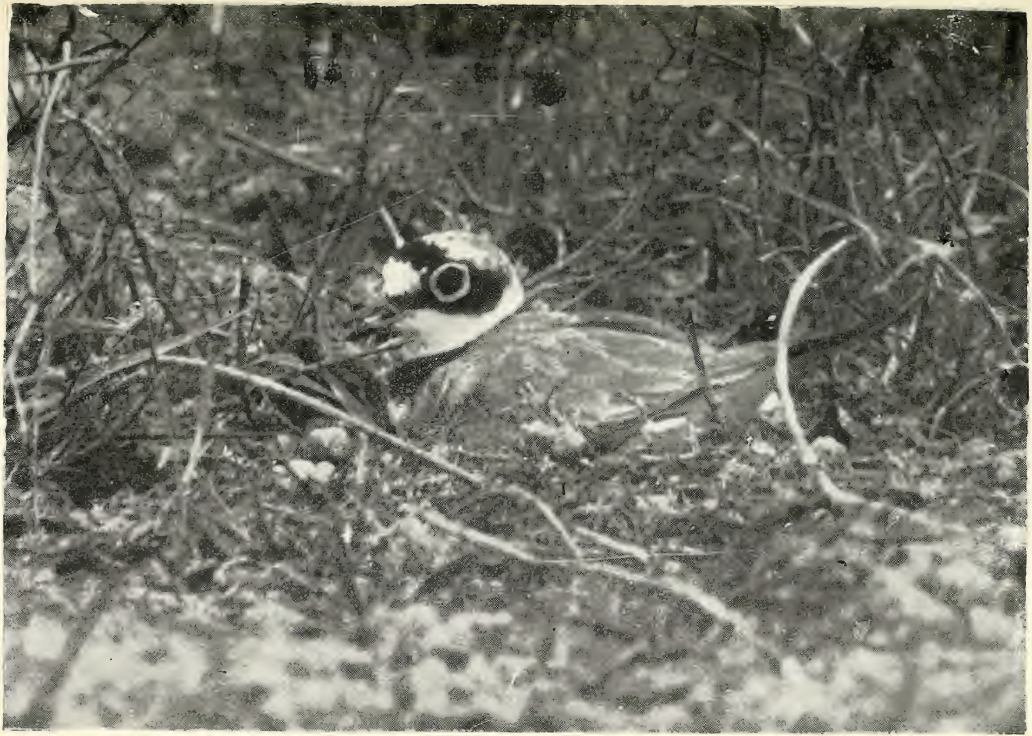


Photo by *W. W. A. Phillips*

Little Ringed Plover incubating.

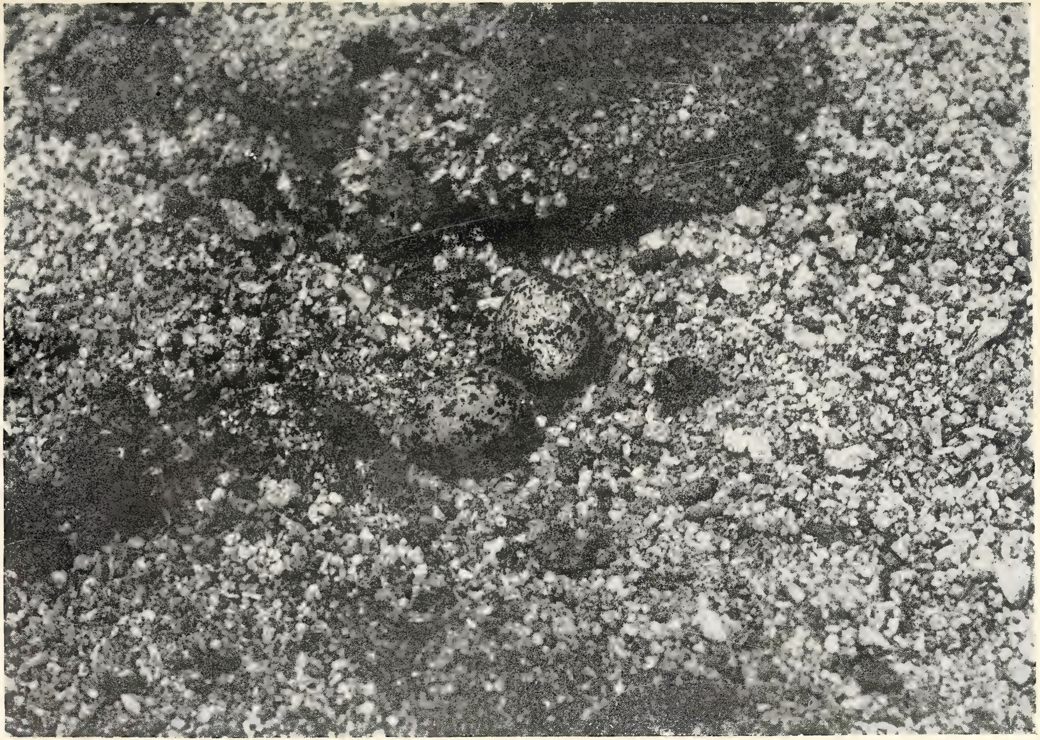
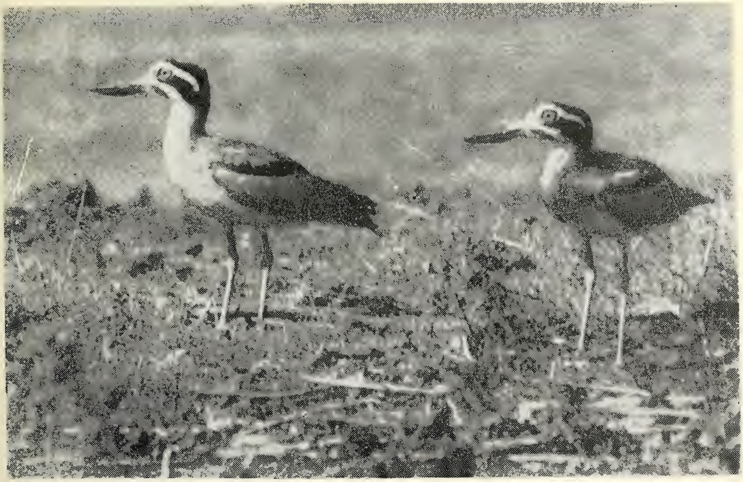


Photo by *W. W. A. Phillips*

Eggs of Great Stone-Plover.



Great Stone-Plover—a pair on
Sanctuary islet.

Photos by *W. W. A. Phillips*

Stone-Plover incubating eggs on
Sanctuary islet.

Downy chick of Great Stone-Plover.

Photos by *W. W. A. Phillips*

Young Great Stone-Plovers.

islets lie exposed; these form an irresistible attraction. They lay from January to August, but chiefly during June and July. Their eggs, either two or one in number, are placed in a variety of situations; I have found them laid on the living rock, on islets in large tanks, in shallow scrapes on shingle banks and sand dunes, amongst the debris above the high-tide mark on raised sandy beaches and in slight depressions in the hard sun-baked mud on the shores of lagoons. Always the eggs are out in the open with no manner of shade to shelter the sitting bird from the fierce rays of the midsummer sun—but generally there is some dry vegetation, debris, stones, lumps of dry mud or desiccated cow-dung close by, to break up the surroundings and save the eggs from becoming too conspicuous on the bare, flat ground. Although the eggs are as large as a heron's, they are most difficult to find; they have a deep stone ground-colour with numerous blotches and spots, streaks and scribblings of dark umber brown and black. And very necessary it is that their concealing colours should be so adequate, for the stone plover, being a large and rather conspicuous bird, cannot continue to cover them when danger threatens. On the slightest indication of the approach of a disturbing element the incubating bird leaves the nest and takes up an innocent and disinterested-looking attitude some distance away, leaving the eggs to their fate and trusting to their concealing colours to escape detection. In similar circumstances, the young are left to their own devices, while the parents fly off with plaintive cries. But as they too are so concealing coloured, the parents usually have little need to worry; it is most difficult to find them even if their presence in the immediate vicinity is known.

Great Stone Plovers are, of course, chiefly nocturnal in their habits, as may be deduced from their very large eyes. They spend much of the day sleeping and resting on some remote sand-bank, islet or dune; but as evening closes in they become active and start flighting to their feeding grounds. Then it is that their wild, wailing cries—*kree-kree-kree kre-kre-kre-kre-kre*—echo through the gloom, thrilling the listener and adding charm and fascination to the remote sea beaches and secluded wilds—for are they not the embodied spirits of these wild and desolate wastes?

SOME NEW SPECIES OF SOUTH INDIAN PLANTS

BY

K. CHERIAN JACOB, L.Ag., F.L.S.

Agricultural Research Institute, Coimbatore

(*With 3 plates*)

Dimeria kanijirapallilana K. C. Jacob, sp. nov. *Gramineae.*

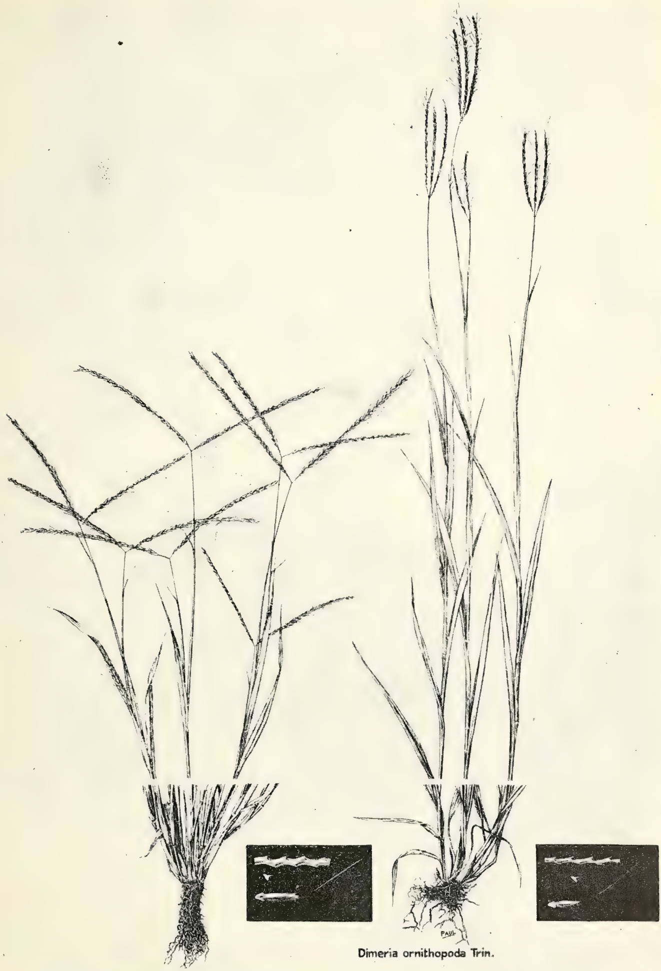
Speciei *Dimeria ornithopoda* Trin., similis est, sed differt ab hac specie spicis divaricatis, quae sunt 2 tantum. Folia sine capillis, sed tantum aliquantulum ciliata bulbosis capillis.

Tenera, annua graminis herba, caespitosa, 20 ad 30 cm. alta. Culmi erecti, aliquando cum ramis e basi surgentibus; nodi fusci, cum parvis capillis. Folia erecta, linearia, subtiliter acuminata, vagina inclusa 6 ad 10 cm. longa, 2 ad 3 mm. lata, cum pancis ciliis e bulbosa basi surgentibus; vagina glabra; margines vaginae hyalini in ligulam 1 mm. longam exeuntes. Racemi (spicae) 2, divaricati, 4 ad 7 cm. longi, rarissime solitares, praesertim ii qui sub fine anni temporis producuntur; rachis dorso plana et cum angustis marginibus, lateris ventralis medio densata, nodis spicularum exceptis marginata, 1 mm. lata, glabra, margine pubescens. Spiculae sessiles, 2 mm. longae exclusa arista quae est 1 cm. longa; callus villosus cum parvis lutescentibus capillis. Glumae 2; ima gluma tenera, linearis, acuta 3 mm. longa; superior gluma longior, 3 ad 5 mm. longa cum pancis longis capillis carinae affixis. Lemmata 2; imum lemma tenerrimum, 1.5 mm. longum, hyalinum; superius lemma 2.5 mm. longum, hyalinum, bifidum, sinu aristatum; arista 1 cm. longa, columna 3 mm. longa, brunnea, parte superiori brunnea, capillaris. Stamina 2 filamentis parvissimis; antherae 1 mm. longae. Granum lineare.

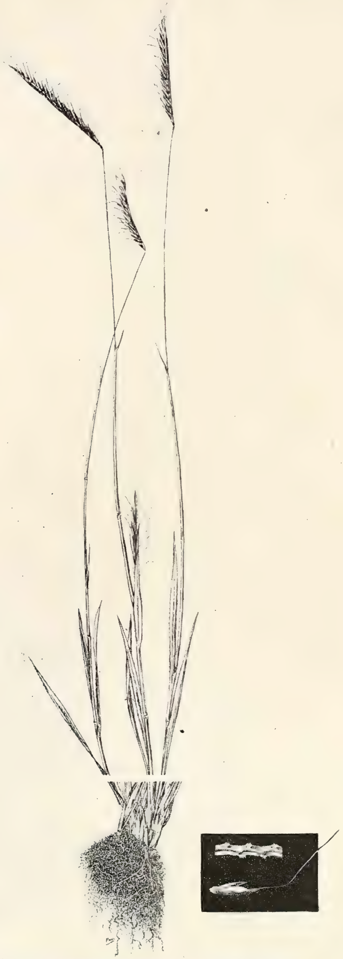
Comes near to *Dimeria ornithopoda* Trin. but differs from it, in the divaricate spikes which are only 2. Leaves not hairy but are only sparsely ciliate with bulbous based hairs.

Slender tufted annual grass, 20-30 cm. high. *Culms* erect, occasionally branched from near the base; nodes dark with few long hairs. *Leaves* erect, linear, finely acuminate, 6-10 cm. long including the sheath, 2-3 mm. broad, sparsely ciliate with bulbous based hairs; sheath glabrous; margins of the sheath hyaline which end in a ligule of 1 mm. long. *Racemes* (spikes) 2, divaricate, very rarely solitary especially the ones produced at the end of the season, 4-7 cm. long; rhachis flat on dorsal side with narrow margins; ventral side thickened towards the middle and margined except at the joints of the spikelets, 1 mm. broad, glabrous, pubescent on the margins. *Spikelets* sessile 2 mm. long excluding the 1 cm. long awn; callus villous with short yellowish hairs. *Glumes* 2, lower, slender, linear, acute, 3 mm. long, upper longer than the lower, 3.5 mm. long with a few long hairs on the keel. *Lemmas* 2, the lower very slender, 1.5 mm. long, hyaline; the upper 2.5 mm. long, hyaline, 2-fid, awned at the sinus; awn 1 cm. long, column 3 mm.

PLATE I.


PAUL
Dimeria ornithopoda Trin.
Dimeria kanjirapallilana K.C. Jacob, sp. nov.

A new species of South Indian plant. *C. Jacob.*



Dimeria kurumthotticalana K.C. Jacob, sp. nov.

A new species of South Indian plant. *C. Jacob.*

long, brown, the upper part brown, capillary. Stamens 2; filaments very short; anthers 1 mm. long. Grain linear.

Chief differences are given hereunder in tabular form.

Dimeria kanjirapallilana K. C. Jacob	*Dimeria ornithopoda* Trin
1. Rhachis $\frac{3}{4}$ mm. broad.	1. Rhachis $\frac{1}{2}$ mm. broad.
2. Rhachis zigzag.	2. Rhachis nearly straight.
3. Spikelets equidistant from one another.	3. Spikelets not equidistant.
4. Margins of rhachis beset with bulbous-based short bristles.	4. Margins of rhachis slightly pubescent.
5. Spikelets nearly 4 mm. long.	5. Spikelets nearly 3 mm. long.

Type locality:—South India, Travancore, Peermade; elevation 3,200 ft.

Type in Madras Herbarium, Coimbatore. Madras Herbarium No. 86320.

Collected by K. Cherian Jacob in December 1941.

Dimeria kurumthotticalana K. C. Jacob, sp. nov. *Gramineae*

Speciei *Dimeria Lawsoni* C. E. C. Fisher, assimilatur, sed differt ab hac specie in eo quod ala summa tertia parte carinae glumae superioris continetur.

Graminis herba, tenera annua caespitosa, 20 ad 35 mm. alta. Culmi erecti, sine ramis; nodi fusci, longis capillis cooperti. Folia plerumque e basi surgentia anguste linearia, 3 mm. lata, acuminata, vagina inclusa 7 ad 10 cm. longa, hirsuta, cum bulbosis capillis; vagina glabra; ligula 1 mm. longa, aculeata. Spica solitaris, 3 ad 4.5 cm. longa, primum erecta deinde basi incurvata; rachis plana, 1 mm. lata, glabra, margine ciliata. Spiculae 5 mm. longae, sessiles; callus brevis, barbatus. Glumae 2, coriaceae, divaricatae in flore, inferior gluma 4 mm. longa, acuminata, superior gluma 5 mm. longa, carinata, margines ciliati, hyalini; carina alata in summa tertia parte, cum albis longisque capillis sub ala. Lemmata 2, glumis parvioria, hyalina, imum lemma ciliatum, superius bifidum, cum arista 1 mm. longa, sub medio curvatum ad imam partem brunneo colore, ad superiorem partem stramineo colore. Stamina 2; styli 2, singulares. Granum lineare, aliquantulum compressum.

Comes near to *Dimeria Lawsoni* C. E. C. Fisher but differs from it, in having the wing confined to a third of the keel of the upper glume towards the top.

Slender tufted annual grass, 20-35 cm. high. *Culms* erect, not branched; nodes dark and beset with long white hairs. *Leaves* mostly basal, narrowly linear, acuminate, 7-10 cm. long inclusive of sheath and 3 mm. broad, hirsute with bulbous based hairs; sheaths glabrous; ligule 1 mm. long, pointed. *Raceme* (spike) solitary, 3-4.5 cm. long, at first erect, then bent inwards at the base; rhachis flat, 1 mm. broad, glabrous, ciliate on the margins. *Spikelets* 5 mm. long, sessile; callus short, bearded. *Glumes* 2, coriaceous, divaricate in flower, the lower 4 mm. long, acuminate, the upper 5 mm. long, keeled; margins hyaline and ciliate, the keel winged to a third of its length towards the apex with long white hairs below the wing. *Lemmas* 2, shorter than the glumes, hyaline; the lower ciliate; the upper bifid with an awn 1 cm. long, bent below the middle, bottom portion brown and the top straw coloured. *Stamens* 2; styles; 2, free. *Grain* linear, slightly compressed.

Chief differences are given hereunder in tabular form.

Dimeria kurumthotticalana—	*Dimeria Lawsoni* C. Fisch.—
1. Leaves 7-10 cm. long.	1. Leaves (2.5—6.2 cm.) long.
2. Spike 3-4.5 cm. long.	2. Spike 1.7—3.2 cm. long.
3. Keel of upper glume winged to a third towards apex.	3. Keel of upper glume narrowly winged throughout.
4. Keel of upper glume ciliate only below the wings.	4. Keel of upper glume ciliate throughout.

Type locality:—South India, Travancore, Peermade; elevation 3,200 ft.

Type in Madras Herbarium, Coimbatore. Madras Herbarium No. 86320 A.

Collected by K. Cherian Jacob in December 1941.

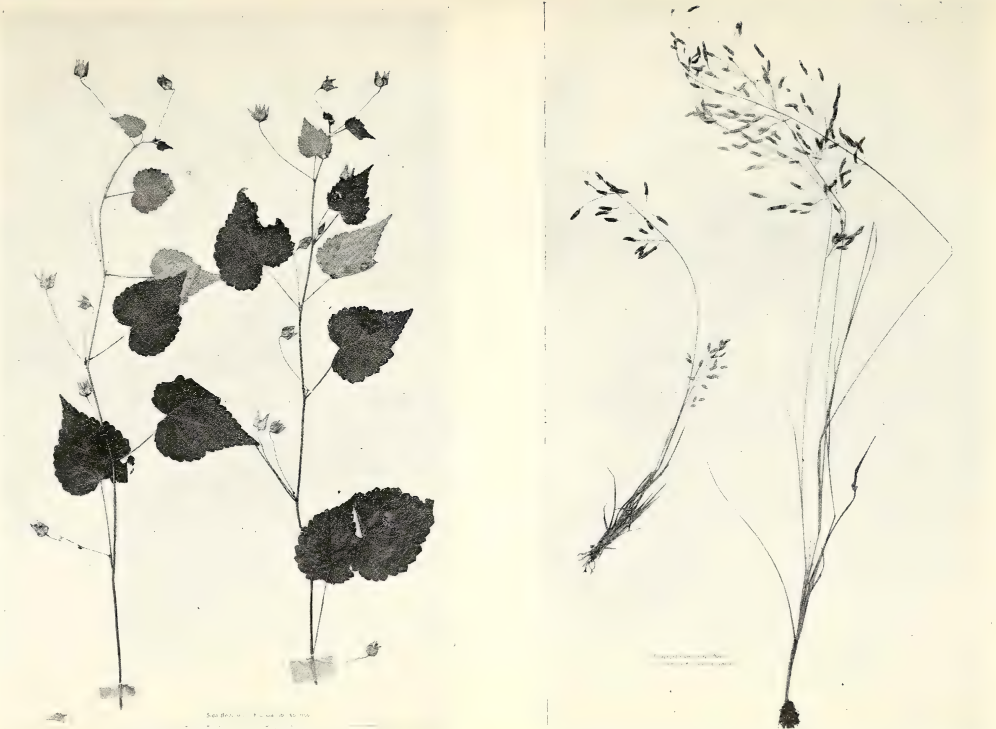
Sida Beddomei K. C. Jacob, sp. nov. *Malvaceae—Malveae.*

Ad speciem *Sida veronicaefolia* (Lam.) (*Sida humilis* Willd.) proxime accedit, sed differt ab hac specie corolla calyceque amplo, calcycis lobis amplis et acuminatis, pedicellis sub calyce articulatis et muticosis planisque processibus carpellorum. Herba perennis; rami teneri 40 ad 50 cm. longi, prostrati vel terram verrentes, nodis aliquando radicantes, aliquantulum capillosi. Folia: lamina 4 ad 5 cm. longa, cordata, ovata, acuminata, crenato-serrata, paucos fercus capillos cum stellatis capillis ad mixtos; petiolus 3 ad 4.5 cm. longus cum stellatis capillis uni lateri insertis. Flores axillares, solitares vel rami axillares ad pedunculos duos pedicellos ferentes redacti; pedunculus 1 cm. longus; pedicelli 3 ad 4.5 cm. longi, teneri, articulati; articulatio 4 ad 9 mm. sub calyce. Calyx 8 ad 9 mm. longus, pubescens stellatis capillis admixtis; calycis lobi 6 ad 7 mm. longi, cum 3 vel 5 venis, acuminati. Corolla flava, tam longa quam calyx. Carpella 5 cum planis, muticosis processibus, ad apices aliquantum pubescentia. Semina nigro-fusca, glabra.

Sida Beddomei K. C. Jacob, sp.nov. *Malvaceae—Malveae* is allied to *Sida veronicaefolia* Lam. (*Sida humilis* Willd.) and differs from it in its large calyx and corolla, large and acuminate calyx lobes, pedicels jointed near the flower and carpels with flat muticous processes.

A perennial herb; branches slender, 40-50 cm. long, prostrate or trailing, sometimes rooting at the nodes, sparsely hairy. *Leaves* (lamina) 4-5 cm. long, cordate, ovate, acuminate, crenate-serrate, sparsely hairy mixed with stellate hairs; petiole 3-4.5 cm. long with stellate hairs on one side. *Inflorescence* axillary, solitary, or the axillary branches reduced to peduncles bearing two pedicels, peduncle 1 cm. long; pedicels 3-4.5 cm. long, slender, jointed, joints 4-9 mm. near the flowers. *Calyx* 8-9 mm. long, pubescent mixed with stellate hairs, calyx lobe 6-7 mm. long, 3-5 veined and acuminate. *Corolla* yellow, as long as the calyx. *Carpels* 5 with flat muticous processes, sparsely pubescent towards the apex. *Seeds* dark brown, glabrous.

Type.—Madras Herbarium, Coimbatore, No. 3611
Type locality.—Kannoth, Malabar District
Collector of the Type.—K. Cherian Jacob
Distribution.—Coorg and South Kanara



Sida Beddomei K.C. Jacob, sp. nov.

Eragrostis unioloides Nees *var. tremula* K.C. Jacob, var. nov.

New species of South Indian plants.

C. Jacob.

Chief differences are given hereunder in tabular form :—

Sida veronicaefolia Lam.—	*Sida Beddomei* K. C. Jacob sp. nov.—
1. The whole plant pubescent.	Plant very sparsely pubescent,
2. Leaves acute.	leaves acuminate.
3. The pedicels jointed near the middle.	Pedicels jointed near the flower.
4. Calyx 3-4 mm. long.	Calyx 8-9 mm. long.
5. Calyx lobe is ½ as long as the tube.	Calyx lobe is 2-2½ times longer than the tube.
6. Carpels with unequally two-lipped beaks.	Carpels with flat muticous processes.

The specific name is after Col. R. H. Beddome, F.L.S., late Chief Conservator of Forests, Madras, who collected a specimen of this plant in 1873 and wrongly identified it as *Laguna lobata*—*Hibiscus solandra* L'Herit. which is in the Madras Herbarium, Coimbatore. The basal leaves and the flowers have some resemblance to those of this new plant.

Eragrostis unioloides Nees. var. **tremula** K. C. Jacob var. nov.—*Gramineae.*

Nova haec varietas differt ac *Eragrostis unioloides,* Nees. Sequentibus signis. Panicula effusa; ramis paniculae longis, teneris, saepeque nutantibus; spiculis oblongis, angustis, saepeque 40-70 floratis; granis ellypticis, granis typi multo parvioribus.

Eragrostis unioloides Nees. var. *tremula* K. C. Jacob—*Gramineae.* This new variety differs from the species in the following characters:—The panicle effuse; branches of panicle long, slender and often nodding. Spikelets oblong, narrow and often 40-70 flowered. Grain ellipsoid and much smaller than that of the species.

Type locality :—South India, Travancore, Tiruvalla; elevation about 100 ft.

Collected by K. Cherian Jacob in November 1941.

Type in Madras Herbarium, Coimbatore. Madras Herbarium No. 86288.

My thanks are due to Father A. Rapinat, S.J., Professor of Botany, St. Joseph's College, Trichinopoly, for kindly rendering the English description into Latin, and to Sri. S. N. Chandrasekara Iyer, M.A., Lecturer in Botany and Curator of the Madras Herbarium, Coimbatore, for affording facilities in the preparation of this article.

NOTES ON A FLYING SQUIRREL (*PETAURISTA* Sp.)

BY

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(*With a plate*)

This article gives an account of a flying squirrel which lived in my bungalow as a pet for almost two years, giving exceptional opportunities for observing its habits and external characters. The specimen was taken at Mukteswar in the Kumaon hills (7,500 feet) in July 1944. It was a male and evidently young, perhaps three months, and weighed 400 gm. Just before being received as a pet, it had served as an experimental animal in connection with research on foot-and-mouth disease to the virus of which it was found to be insusceptible.

As is well known, in flying squirrels the skin along the sides of the body is extended to form a flying membrane or 'parachute' when the fore and hind limbs are stretched out in the act of springing from tree to tree. The animals are strictly arboreal, living in holes in trees, and are nocturnal in habits, sleeping during the day and feeding at night on fruit, green shoots, etc.

Classification.—Descriptions of certain species of flying squirrel are given in the works of Sterndale (1884) and Blanford (1888) and in the journals of the Asiatic Society of Bengal and of the Bombay Natural History Society. The genus *Petaurista* (Family: Sciuridae) is placed by Ellerman (1940) in the 'Pteromys Group'. In some older classifications the genus *Petaurista* was called *Pteromys*, but the genus *Pteromys* is now restricted by Ellerman to flying squirrels found in the Palaearctic region, whereas *Petaurista* is also distributed over the Indo-Malayan region. My specimen certainly belongs to Ellerman's '*albiventer* Section'. Wroughton (1919), in the Society's Indian Mammal Survey, gives a key to the Indo-Malayan species of *Petaurista*. From this it appears that my specimen is *P. caniceps* Gray, a form closely resembling *P. albiventer* Gray. According to Wroughton, *P. caniceps* has been recorded from Darjeeling, Sikkim and Nepal, and *P. albiventer* from Nepal, Sikkim and Kumaon. It is possible therefore that this is the first record of the *caniceps* species from the Kumaon.

External characters.—The animal showed good growth of body and fur and by February 1945 the greatest weight was recorded, viz., 1193 gm. (2½ lbs.). Body length when adult was 76 cm. from nose to tip of tail, length of tail 38 cm., full expanse of body and parachute about 35 cm. (figs. 1 & 2). The parachute is extended anteriorly as a membrane running from the side of the neck to

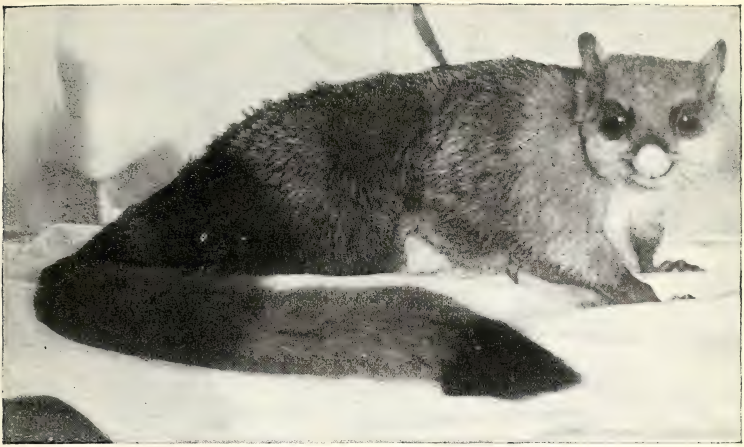

Fig. 1. *Petaurista caniceps* Gray.

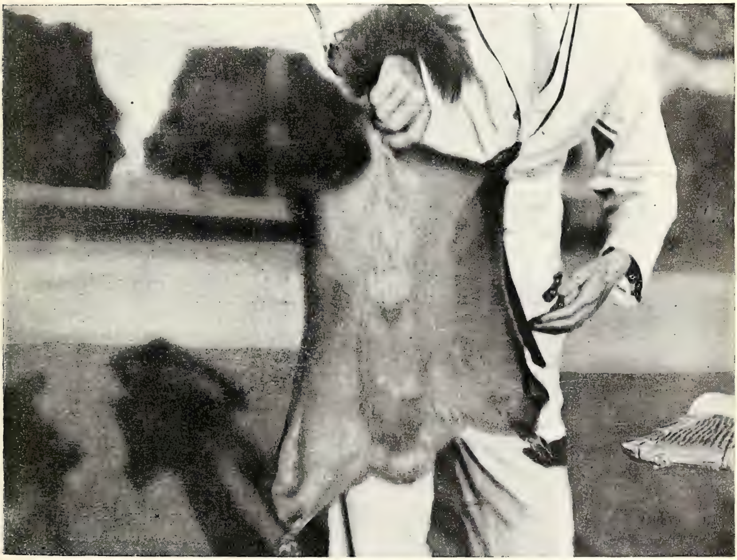

Fig. 2. Ventral surface of body and parachute.

the fore limb, and posteriorly from about the ankle to the second or third inch of the tail. The fur of the back and sides of the body is paler than that of the upper surface of the parachute, which is a uniform dark chestnut, the pallor of the dorsal fur being due to grizzling with parti-coloured hairs containing white near the tips. The ventral surface of the parachute is fulvous, tinged with white, and its outer margin grey. The tail is cylindrical, blackish-chestnut and the last inch of it black. In the normal sitting posture the tail is carried squirrel fashion, i.e., upwards over the back with the extremity turned downwards. The outer fur of the limbs is chestnut and the feet blackish.

The head is dorsally flattened, with the fur over the cranial region concolourous with that of the back. The short fur over the back of the ears is chestnut and that of the cheeks grey,—these, according to Wroughton, are two important specific characters. The aural pinnae are short, erect and rounded and the opening set in a forward and outward direction. The eyes are large, prominent and staring, and surrounded by a black ring (fig. 1). The snout is bare, blunt and flesh-coloured, and adapted for removing obstructions, as when the animal prepares a 'nest' for itself in a tree. The mouth is set ventrally, and the upper lip has a median cleft, partly exposing the two upper incisors which are brown and have a fine cutting edge. There is a black band over the nose and a circular black spot beneath the chin. Whiskers are black. The sides of the neck are fulvous, throat and fore part of breast white, passing to fulvous over the belly; grey over scrotum and around anus.

The posterior surface of the metatarsus consists on its inner part of black hairless pad skin, about 4 × 2 cm.; there is a similar hairless pad area below the carpus and well behind the digits. When the animal rests on all four feet, its forward weight is borne on the carpal pads and not on the claws. Below the carpus on the inner side is a pad serving as a thumb, by means of which very small objects can be securely held, when the digits are brought into the flexed position. The fore limb carries the usual four digits and the hind limb five. The laterally flattened claws are very sharp and downward curved. Those on the fore limb are long and adapted for clinging, so that there is no danger of the animal falling when passing from branch to branch. Extending backwards from the ulnar side of the carpus to the elbow is the usual cartilaginous spur which by projecting outwards during 'flight' helps to keep the skin flaps rigid. This spur is 9 cm. long, tapering to a fine point posteriorly. To hold this cartilage in a fixed position during gliding, there is a mechanism which appears to depend on combined muscular and ligamentous action. The fore limbs are set wide apart and slightly bent so as to facilitate climbing the trunks of trees.

The testes when fully developed were ovoid and about 3 × 1·5 cm., and had descended into a very pendulous scrotum at ten months of age.

Behaviour.—The squirrel was given full liberty within closed rooms. Favourite spots for sleeping were a recess above a mantelpiece or the top shelf in the corner of a dark cupboard. In these places he was content to stay for hours curled up on his side with tail bound around neck and face. If awakened, he usually indulged in a mighty stretching of the limbs and yawning. From very early life he showed great inclination to climb, for instance having installed himself on a certain pole or picture rail he was often on the look-out for a chance to reach a higher level. He was much more adept at climbing than at descending, except by the usual gliding method. At this young age too diving to the ground from heights of 10 feet or so was a frequent performance and, although landing with some force, he never injured himself. Once the faculty of steering to avoid an obstacle in its path (ceiling fan) was noted. Another favourite pastime was leaping from the ground on to the bodies of people moving about the room, climbing to the shoulders or even to the top of the head, springing after a while on to some convenient raised object, such as a mantelpiece, and then repeating the performance again and again.

Towards midnight he usually became very active, a favourite occupation being a to-and-fro excursion along some narrow ledge with repeated upward stretching as if seeking a higher level. This exercise was carried on at frequent intervals throughout the night and during this time any remains of the day's food were invariably consumed. Periodically, the animal groomed himself with his tongue, after the manner of a cat, and washed his face by sneezing on to the hands and then rubbing them over the face. It was curious to observe the way in which the animal by a rapid movement of one fore limb brought the cartilaginous spur and attached membrane into a forward projecting position, where it was held by the other hand, for the purpose of cleaning it. The movement consisted of a rotation of the wrist so that the palm of the hand faced upwards, the hand at the same time being fully flexed on the wrist.

Sometimes, during the night he would utter a series of calls, obviously sexual in nature. These consisted of rather high-pitched expiratory monotones, of several seconds' duration, and quickly repeated up to twenty times or more. A similar note, however, was occasionally uttered through fright. At Mukteswar in July squirrels have been heard giving these calls at night. A most peculiar but less frequent call was a muffled whirring sound, somewhat like that of a clockwork spring when it is allowed to run down.

When fully adult, he became extremely tame, though was always somewhat timid. When taking food, the squirrel frequently stopped with a listening attitude, exhibiting a high sensitivity to sound. As to sight, little can be said, except that there was an intolerance of bright sunlight. If placed on the lawn during the daytime, he would at once race for the house, quickly mount the stairs and take refuge in his favourite corner.

On a number of occasions at night the squirrel escaped from the bungalow to nearby trees where sometime was spent in leaping from branch to branch and gliding from tree to tree. After dark, the desire to escape was sometimes particularly intense—possibly because the subject was a male; often after being free for three or four days, he had to be rescued from some hole in a tree in or near the compound. On four or five occasions he escaped by way of the chimney.

It is noteworthy that once he returned to the bungalow of his own accord at daybreak and that during the period of two years he never travelled far from the compound. After these escapes he was always very thirsty and ravenous for food.

On the ground over short distances, the squirrel could move with considerable speed, progressing by a series of jumps, with hind legs widely abducted. Donald (1917) gives a popular account of a female *Petaurista* kept as a pet from a few days old to adult life. He refers to the mode of progression on the ground as a 'lumbering gallop with all four feet in the air at the same time and with tail held straight in the air'. If suddenly alarmed, the squirrel was capable of extremely rapid movement.

From early days the squirrel grew to be on the best terms with my dachshunds. When it was young, it would go for short walks with them and also developed the habit of chasing them, clinging to their hind quarters and making repeated attempts to mate. When first caught, the squirrel was slightly afflicted with ringworm behind the ears and this sexual behaviour resulted in the infection being transmitted to one of the dogs.

With regard to character, the squirrel evinced the senses of curiosity and obstinacy common to wild animals. He was persistent in his efforts to get into the favourite cupboard if the door was closed, and he frequently succeeded in releasing the catch with his teeth. After a meal he was sometimes playful. Mild annoyance was shown by grunting, and anger by hissing. In early life, when deeply provoked, he would stand bear-like on the hind pads, occasionally attempting to bite and making inward sweeps with the fore limbs with the intention of scratching or tearing. But such exhibitions were extremely rare and always transitory. Normally, there was no trouble at all in handling the animal, though at times one had to beware of scratches.

Although the normal habitat of the species is the hilly areas, the specimen did well when brought to the plains of the United Provinces for the cool and early hot seasons. Air temperatures up to 85°F. were supported without distress.

The final escape was in June 1946 through a bathroom waste pipe which owing to neglect was uncovered.

Feeding and excretion.—The animal was fed twice daily, morning and afternoon, with bread, cake or biscuit soaked in milk sweetened with sugar. A little fruit was given once daily, such as apple, plum, banana, mango, guava, sweetened grape-fruit, melon or tomato. Rose petals and to some extent rose leaves were relished. Apart from all these, the favourite food and presumably that most taken in nature—was the leaves and soft stems of mountain oak. Other leaves and stems would also be taken, such as apple, deodar and rhododendron. The usual method was to bite through the stem and grasp the detached leaf in one hand while eating. Vegetables were refused, as well as any kind of meat. Nuts of various kinds were eaten but not relished. Water was refused, unless there was great thirst, but milk was eagerly lapped. Movements of the jaws during mastication were extremely rapid.

As soon as the nightly activity began, faeces and urine were passed, though sometimes faeces were only passed once in 48 hours. The act of defaecation was preferably carried out from a high perch, the faeces being green or brown, dryish and in the form of small pellets which were expelled intermittently over some minutes. Urine was passed in spurts; when urinating the squirrel adopted an upright posture, raising its hind quarters off the floor by holding on to a door or wall and thrusting its belly forward. The animal was very clean in its habits and most careful to prevent its fur being wetted by urine. The urine dried leaving a white deposit.

Concluding note.—The flying squirrel has been described as delicate and difficult to keep in captivity, but this is not so once the 'probationary period' is over, if the animal is allowed proper food and an environment which is free and otherwise suitable. In the *Indian Forester* (1932) reference is made to a specimen of *Petaurista inornatus* which lived in the Calcutta Zoo for over eleven years.

Petaurista might even have commercial value, if they could be satisfactorily bred in captivity, as the skins should find a ready sale. The main difficulty would be to get the first catch accustomed to domestic life. From my small experience it seems that within a few days of capture fatalities are likely, these presumably originating from immaturity or in older specimens from hyperactivity of certain of the endocrine glands. If this is so, it is just possible that deaths in ones which have passed the stage of babyhood could be avoided by inducing a state of mild anaesthesia during the first few days of captivity.

It is unfortunate that so far there has been no chance to observe the reproductive life of the species, though a number of attempts were made to secure a female. When adults are first caught, they may be extremely ferocious. One large female, which must have weighed at least 4 lbs. when caught, appeared to be quite untameable, refused all food and died after a few days of 'pneumonia'. A second specimen, a half-grown female, was also very wild when caught in September 1945 and succumbed from pulmonary oedema one day later. This female measured 66 cm. from snout to tip of tail, the tail was 35 cm. long, and the width of body and extended parachute 25 cm. The body colouring was exactly like that of my specimen, and its skin, as well as that of another younger *Petaurista*, is in my possession.

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I am greatly indebted to Dr. B. N. Chopra, Director of the Zoological Survey, for making available to me the works of Ellerman and Wroughton. My thanks are also due to Mr. M. Abdussalam of this Institute for showing me Donald's booklet. Mr. Abdussalam tested the squirrel with foot-and-mouth disease virus.

BIRDS OF THE LALMAI AREA, NEAR COMILLA, TIPPERA, BENGAL.

(*Observed between December 1944 and end of July, 1945*).

BY

S. J. K. Collins

(*With a map*)

Nature of Surroundings.

Mainly open cultivations (paddy) which, during the winter months, are used for cattle-grazing. The fields are ploughed from February onwards, paddy being planted out between March and April, in readiness for the monsoons which break round about this period.

The whole of the area is sprinkled with villages or collections of habitations, usually each group having an earthen irrigation or water storage tank within its 'boundary'. The 'villages', in the main, are completely enshrouded by trees and bamboos, whilst a tangled undergrowth quickly envelopes the area during the monsoons.

Behind, and to the west of Lalmai station lies a series of higher levels stretching from south-west of Lalmai to the west of Comilla, and known to the military as 'The Ridge'. This area consists mainly of scrub-clad hillocks, with minor cultivations in the lower intervening levels or valleys.

There is only one river of any size, known as the 'Gungiajuri Chara' to military authorities, which either rises in or flows through the ridge, passing eastwards under the railway about 5 miles from Comilla, then turning south to loop round under the railway again about a mile below Lalmai on the Chandpur side.

For further details, see accompanying sketch-map of the area, although this is *not* drawn to scale and cannot be vouched for as accurate.

Family : Corvidae.

Corvus macrorhynchos : Jungle Crow.

Common and plentiful. Five nests found up to the middle of April, but only one considered to contain either young or eggs, judging by the reactions of the crows to our attentions. The nest site was, unfortunately, not possible to investigate, being placed in the top of a 'Palmyra' palm some 25 feet above the ground.

Nesting activities appeared to commence again in July, as most of the crows from the vicinity of our camp could be seen flying up into palms or other tall trees carrying what seemed to be pieces of coconut fibre and sticks.

The jungle crows were always present with the mixed company of birds whenever the winged termites were on the wing during January. Their methods of catching the termites varied from clumsy attempts to catch the insects on the wing by using their bills like the drongos, etc., to the more certain method of assembling on the ground close to the place where the termites were emerging, and catching the insects before they took to the air.

I was never able to find the roosting places of these crows, although they could be seen flying eastwards every evening from 17-30 hrs. onwards.

These birds were among the first abroad in the mornings.

Corvus splendens : Common Indian House Crow.

The house crows were confined to the area around Comilla township up to the first week in May, when they started to frequent the many military camps in the Lalmai area. The first time the house crows were noted in our camp was on 9 May, when ten were seen in the vicinity of the African cookhouses. Five were again seen on 16 May, and then from the beginning of June and all through July, the house crows were well established.

Dendrocitta vagabunda : Tree-pie.

Fairly common in our vicinity, but more often heard than seen. Immature birds were seen in June and July, but no nests were found.

The tree-pies occasionally assembled with the 'termite-hunters' during January, on one occasion as many as 20 being seen. They also frequented the silk-cotton trees whilst these were in bloom.

These birds were amazing for their variety of calls. Some of the notes were as follows :—

(i) A repeated 'Ki-cha-cha-cha'.
(ii) A harsh chuckle, rather similar to some calls used by broody domestic hens.
(iii) A very musical, soft 'Toodle-li', sounding rather like the limpid notes of a vibraphone.
(iv) A harsh 'Care', similar to but not so guttural as those occasionally used by jungle crows.

FAMILY : TIMALIIDAE.

Turdoides somervillei : Jungle-Babbler.

The jungle-babblers were confined more to the scrub-clad hills lying behind the camp in an area known to the military as 'The Ridge'. In the small area of the ridge that I visited, one party was seen on two occasions. Each time the birds were moving around in the thicker bushes and on being alarmed flew off in single-file to other clumps.

Later, in May, when that part of the Ridge was being used for military camp sites, I saw three babblers on a small knoll a short distance behind our camp, and although I frequented this area almost every day, I did not see them again.

Aegithina tiphia : Common Iora.

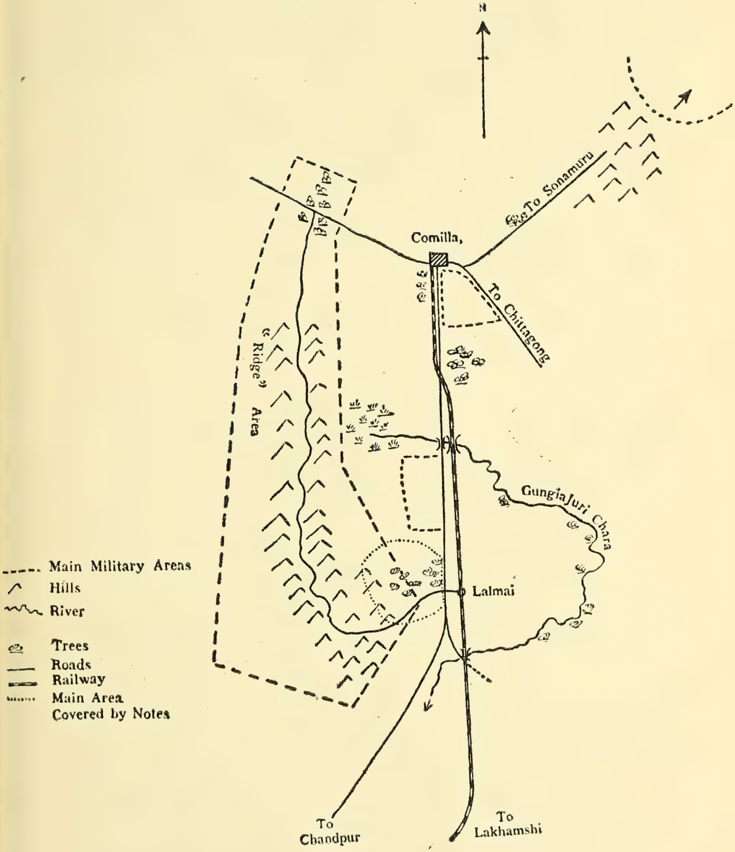
Common and fairly plentiful from December to February. Mostly seen in parties of a dozen or more, feeding or hunting insects in bushes and bush-like trees in the camp area. From March onwards, the parties seemed split up, and the Ioras were more frequently seen in pairs or singly until July, when family parties were seen about.

No occupied nests were found—the only indication of them having bred were the family parties and one old nest found on the ground under a mango tree, this being cup-shaped, about 2 inches in diameter, composed of fine fibres and plastered externally with cobwebs, thus giving the nest a white appearance.

FAMILY : PYCNONOTIDAE.

Molpastes cafer : Red-vented Bulbul.

Common and plentiful. One of the party that assembled at the silk-cotton trees whilst they were in bloom, and also seen occasionally with the 'termite-hunters' during January.


N
To Sonamuru
Comilla,
To Chittagong
"Ridge" Area
Gungiajuri Chara
Lalmai
To Chandpur
To Lakhamshi
Main Military Areas
Hills
River
Trees
Roads
Railway
Main Area Covered by Notes

Rough sketch map of Lalmai Area, near Comilla, Tippera, Bengal.

Four nests found, three containing clutches of three eggs, situated in forks of trees or preferably among the dense young shoots sprouting from a sawn-off branch of a tree, and varying in height from 6 ft. to 16 ft. above the ground. Nests were found in early April, and were of the normal cup-shaped fine twig construction, lined with grass or fibre.

Otocompsa jocosa : Red-whiskered Bulbul.

Seen once only on 29 July. Might have been overlooked, but only one specimen was seen for a few moments early in the morning, and this was very difficult to approach.

FAMILY : TURDIDAE.

Copsychus saularis : Magpie-Robin.

Common. There were two or three pairs in our area, usually seen feeding on the ground under the line of mango trees. One nesting site was seen, the birds (on 15 April) were gathering nesting materials and carrying them to a natural hollow in a mango tree about 5 ft. from the ground. The site, unfortunately, was wrecked by some Indian children before the nest was completed.

Young birds, capable of flight, were seen towards the end of May, June and early July. Two immature birds were the most seen at once with the adults.

Magpie Robins were sometimes seen during January with the 'termite-hunters', taking the insects on the wing. Morning 'song-posts' were usually the tops of fairly tall trees, whence a clear vision was obtainable.

FAMILY : LANIIDAE.

Lanius excubitor :[1] Grey Shrike.

By no means common in the Lalmai area, although they move about so much that it is difficult to follow these birds. The usual haunts are tall, lightly foliaged trees, thorny trees and occasionally the low scrub bordering the paddy fields.

Seldom seen in more than pairs and most frequently seen singly. There was no sign of breeding activities up to the first week in July, when the last record of the bird in our area was 4 July, but these may have been overlooked.

Lanius vitatus :[1] Bay-backed Shrike.

Fairly common from February to April, but disappeared from the area in May—last recorded date being 7 May.

More than the other shrikes, the Bay-backed was seen mainly in the scrub bordering the paddy fields, usually a single bird dominating a paddy field. The most seen together was three.

Tephrodornis pondicerianus : Common Wood-Shrike.

Common in our area. One nest found on 14 April, situated on a horizontal branch of a tree between 15 to 20 ft. above the ground, in full view of the whole camp, but not noticed by me until one of the pair was seen entering the nest to brood the young. The nest contained three young, two of which, a month later, had left the nest and could be seen being fed by the parents during the evenings in the vicinity of a clump of mango trees.

As far as I could discern, both birds fed the young, each adult undertaking to feed one chick. The chicks were just starting to fly (13 May), and were being 'taught' by the parents, who would make a short flight to a nearby branch, calling all the while, and in the event of the young not following, would return to them and repeat the performance until such time as the youngsters followed along. This particular evening a hawk of some sort perched in a nearby tree. One of the parents attacked the hawk immediately, swooping on it and uttering a harsh grating noise, the snap of its bill being audible as it passed over the hawk's head, but it failed to move the bird. The one parent was then joined by its mate, and the concerted attack put the hawk to flight.

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[1] The sight record of these two species must be accepted with reserve. They are both birds of fairly dry—even semi-desert—biotopes. The former has only been recorded as a straggler as far east as Calcutta, and the latter not quite so far east.—EDS.

When the adults brought food to the young, the young gave noise to an excited chatter, accompanied by much wing quivering. As the two young were a little distance apart, they were either fed in rotation by a single adult or individually by one of the parents. The excitement of the young was only evident when an adult was approaching, the remainder of the time they stayed motionless.

FAMILY : DICRURIDAE.

Dicrurus macrocercus : Black Drongo.

Common. A total of ten nests were found between April and the beginning of June, all of them used, and varying in height from 12 to 25 feet above the ground, situated in a horizontal fork of a tree. Young birds, just able to fly, were seen from 26 May onwards.

These birds were most pugnacious during the breeding season, attacking larger hawks, vultures and even human beings with equal ferocity, if they considered their nest was in danger.

The drongos were by far the latest birds to roost at night, and among the earliest risers. When it was almost dark, drongos could be seen and heard having 'mock battles' over the tops of the mango trees.

These birds were invariably present with the 'termite-hunters' during January.

FAMILY : SYLVIIDAE.

Orthotomus sutorius : Tailor-Bird.

Common but not plentiful. Seen in Comilla and Lalmai area but only recognised as such in April. A pair continually frequented a clump of mango trees near our quarters and were far more often heard than seen. One of the pair had a curious habit of roosting in the lowest branches of the mangoes under a leaf, at about 4 to 5 ft. from the ground, and this habit eventually enabled me to have it caught one night about 8 p.m. It was caught by hand, identified and released. On release it struggled so much that it lost several of its tail feathers, and although it never left that particular clump of trees, it could always be identified by its few remaining tail feathers. No nest was found, although I watched the bird carefully for a long time.

FAMILY : ORIOLIDAE.

Oriolus xanthornus : Black-headed Oriole.

Present but not common. Two or three pairs in the area. Three nests were found in the vicinity of the camp, two of which I suspected as belonging to the same pair. The first nest found was situated in a bamboo clump, about 7 ft. from the ground and contained one egg on 24 March. The egg hatched out between 27-28 March and the chick was covered with spine-like feathers during the first week in April. On 9 April I found the nest torn to bits and the chick had vanished.

The second nest was found on 8 April, situated about 10 feet from the ground in a shrub-like tree overhanging the edge of a paddy field, but appeared to contain no eggs. The female was sitting on the morning of 9 April and by that evening there were two eggs in the nest. The nest was unattended on the morning (08.15 hours) of 15 April, and had been wrecked by the morning of 19 April (human efforts suspected).

The third nest was built in our camp, about 8 ft. from the ground, but must have been destroyed by our men when they were 'cleaning up' the camp area, as it disappeared shortly after completion, although no eggs had been laid.

FAMILY : STURNIDAE.

Sturnia malabarica : Grey-headed Myna.

Most common in the camp area whilst the silk-cotton trees were in bloom (March to May). They were first seen in the camp area on 14 January, and during February were using the mango trees for roosting at night. From February until May large numbers of them would assemble from 18.00 hours onwards, and appeared to have some trouble in settling down for the night, as frequently a 'cloud' of them would suddenly leave the trees and fly round for several minutes, executing all sorts of manoeuvres prior to settling in some other tree nearby.

During these months, the mynas were only seen in the daytime whilst there were silk-cotton trees in bloom, otherwise I first saw them at roosting time.

No actual nests were found, although individual birds were seen investigating barbet and woodpecker holes.

The Grey-headed Mynas made up the bulk of the birds which regularly visited the flowering silk-cotton trees.

Acridotheres tristis : Common Myna.

Common and plentiful. Always present in the camp area, particularly near kitchens, stores and messes.

These birds were very tame and would allow quite a close approach. They appeared to have a curious habit of standing around in little groups, fluffing up their feathers and nodding to each other.

Eggs were found in one nest situated under the ridge of a roof on 21 April. Other nesting sites were suspected in the leaves of palmyra palms, being situated at the base of the fronds close to the trunk. Mynas were seen carrying nesting materials to these sites and later also food, but no nests so situated were actually seen by me.

On two occasions common mynas were seen feeding young koels, and due to the open nature of the paddy fields, it was possible to watch one pair feed one young koel continuously from 17.30 hours until darkness rendered further observations impossible. This particular young koel was larger than either of the mynas, and quite capable of fairly sustained flight. We hustled the young koel some distance away to see if the mynas would follow it, and they did. Not having seen the nest of this pair, with the koel in it, I am unable to state definitely that the koels do parasitize the mynas.

Another example was seen about a fortnight later when a pair of young koels (one fairly large and the other only just able to fly) were being fed by another pair of common mynas. Here, too, a prolonged watch revealed the same pair of mynas feeding the two for over a hour. Here, too, a pair of mynas had been suspected of nesting in the same date palm where the two young koels were found, although a search of the palm only revealed remnants of a nest situated close to the trunk of the palm, and constructed of grass.

Another peculiarity about the common myna, noticed particularly from May to July, was that some of the birds appeared to have a yellow wattle-like streak running through the crown of the head. Whether this is some plumage phase of the immature birds, I do not know.

Æthiopsar fuscus : Jungle Myna

Not very common, although possibly overlooked. One nest site found, situated in a hole in the trunk of a tree about 10 ft. from the ground, but the hollow continued for some distance down inside the tree trunk, and it was not possible to see whether there were any eggs in the nest or not. This was in the middle of April.

During May, June and July, parties of between 6 and 20 were occasionally seen on the ripening paddy or in the trees growing on the banks of the paddy-fields.

Sturnopastor contra : Pied Myna.

Common and plentiful. Numerous nests were built in the trees in our camp during April and May, many being destroyed by the high winds and heavy rains. There was nothing of outstanding interest about the structure of the nests, although the sites chosen (on outer extremities of slender branches) were in many cases courting disaster and were duly destroyed by the elements later on in the season. One noticeable point was the number of broken eggs found under the nests, but whether these rolled out with the swaying of the trees or were knocked out by the mynas themselves, I never did learn. A lot of young, unable to fly, were also found on the ground, and my attempts to revive one chick found under a tree during a rainstorm was a failure.

The Pied Mynas were well represented on the silk-cotton trees whilst they were in bloom, but for the main part were seldom seen so near to human habitations as were the common mynas, preferring the more open cultivations and neighbouring trees.

One amusing little part of their behaviour is that of perching close together and uttering their grating calls in each other's ears, noticed especially when the birds are paired off for breeding. These birds seem almost 'colonists' during the breeding season, although the most nests seen in one tree were only a dozen.

FAMILY : PLOCEIDAE.

Ploceus philippinus : The Baya Weaver.

Common. The Bayas were first noticed as common when they started to don breeding plumage. Nests were built in colonies mainly in palmyra palms, but some were seen in thorny trees. The materials used varied from grass to split streamers of date-palm leaves. 'Cock' nests appeared plentiful in every colony. Great amusement was derived from watching these birds unravelling and stealing materials from neighbouring nests in the colony.

Uroloncha punctulata : Spotted Munia.

The Spotted Munias were most in evidence from the end of May to July, when they were starting nesting activities.

One bird was seen on 25 December, but it was not until the beginning of June that the birds were seen with any regularity.

The nests were untidy grassdomed arrangements, built mainly in thickly foliaged small trees, some being seen in the few thorn trees in the camp area, and one in an *Albizzia stipulata*.

From this period, small parties of 4 or more could be seen feeding on the seeds of grasses.

FAMILY : FRINGILLIDAE.

Passer domesticus : House-Sparrow.

Common and plentiful, though more so from February onwards, when nesting operations were in progress. The chief sites used by the House Sparrows when building appeared to be under the ridge of the bamboo-shingle roofs.

A certain amount of difficulty was experienced in identifying these birds in the field, as although large flocks of sparrow-like birds were often seen on the paddy fields, it is quite probable that these birds were mistaken as weavers, and vice-versa.

FAMILY : HIRUNDINIDAE.

Hirundo daurica : Striated Swallow.

Red-rumped Swallows were seen on two occasions only. First on 12 April, a number were seen sporting about over the camp during the afternoon, and disappeared towards evening.

On the second occasion, on 14 April, two were seen circling about over the camp, fairly high up, for a few minutes.

On both occasions the weather was sultry.

FAMILY : MOTACILLIDAE.

Motacilla alba : White Wagtail.

One pair seen in the camp area on 16 December. Another pair seen on the Sonamuru side of Comilla on 20 March, on the edge of an irrigation tank.

Motacilla cinerea : Grey Wagtail.

One seen on 3 April and another on 23 April, feeding on the bank of an irrigation tank close to our camp.

Anthus rufulus : Indian Pipit.

Fairly common throughout my stay in this area, although more frequently seen during April than any other month.

Main haunts appeared to be the paddy fields prior to final ploughing and planting.

Was told that one nest had been found at the edge of a paddy field, but before I could get to see it, the torrential rain had washed it away.

FAMILY : NECTARINIIDAE.

Cinnyris asiatica : Purple Sunbird.

Fairly common, although more noticeable from February onwards. No nests found, although adults seen with young towards the end of April. These birds moved about a lot, and were only in real evidence in our camp when the trees (including silk-cotton, mango and *Albizzia stipulata* and Indian laburnum) were flowering.

Witnessed part of what might have been a courtship display on the afternoon of 16 March. I could not be certain whether the male was chasing the female, or vice-versa, because I was rounding a hut when I caught sight of their downward flight to earth. Stepping clear of the building, I saw the female on the ground, lying or leaning back with one wing held upwards into the air, whilst the male stood back, with extended head and neck, 'pointing' first one way and then the other (left to right movement). There was a flutter, and the pair were both in the same attitude as was the female originally, with their tails (apparently) touching or together. While this was going on both birds kept up a feeble chirping. The pose was held for a matter of seconds only, then the female flew off, closely followed by the male, who was in full song.

The whole 'performance' was only of a few seconds' duration, and due to being caught unawares and on the wrong side of a building, I was unable to see the preliminaries or finale of the act.

Cinnyris zeylonicus : Purple-rumped Sunbird.

Fairly common, though not plentiful, from March onwards. Seldom more than one pair seen during the course of a day. Have met with it both in Comilla, along the Gungiajuri Chara, and in the Lalmai area.

Young birds seen with the adults during April and May.

Family : DICAEIDAE.

Dicaeum erythrorhynchos : Tickell's Flowerpecker.

Seen on several occasions in the vicinity of clumps of the parasitic loranthus. Possibly one pair of flower-peckers inhabited the area around our camp, but the numbers were difficult to gauge due to the scattered localities of the loranthus.

One pair seen in Comilla township, and another seen in the vicinity of habitations along the banks of the Gungiajuri Chara.

Family: Picidae.

Dryobates mahrattensis: Yellow-fronted Pied Woodpecker.

Fairly common, and certainly the most common of the woodpeckers found in the area.

Micropternus brachyurus: Rufous Woodpecker.

Seen on three occasions only—first on 17 May in a bamboo clump, where two (adults ?) were seen close to an insect carton-nest which had a large opening in one side, whilst two (young ?) were clinging precariously to a nearby bamboo. The two birds near the insect nest were feeding on ants (*Crematogaster ?*).

On 16 June, a pair of (adult ?) Rufous Woodpeckers were seen in the mango trees in camp, one bird having a crimson patch below the eyes, whilst this feature was lacking in the other.

On 2 July, one bird was seen in the bamboo clump, but I could not see whether the eye-patch was present or not.

Brachypternus benghalensis: Golden-backed Woodpecker.

About two pairs seen in the area. No nest actually found, although one bird was seen investigating a hollow-branch on a silk-cotton tree.

Iynx torquilla: Wryneck.

Seen four times only, firstly on 4 March, when it was observed feeding at the base of a mango tree. On 11 March, a specimen was brought to me which had been shot in the camp area whilst on the trunk of a sapling.

On 23 and 24 April, a pair were seen in the vicinity of the irrigation tank behind our camp, feeding on the ground under the trees.

Family: Capitonidae.

Megalaima lineatus: Lineated Barbet.

Not very common. Heard continually through March and into April, when one pair was constructing a nesting site in a 'silk cotton' tree some 25 ft. above the ground. This nesting site was disturbed, and although the birds had been working on it for nearly a fortnight, they deserted the site and moved over to a tree-enshrouded habitation about a quarter of a mile away.

There was a definite difference in the call-notes of the pair during March and early April, one bird having a far more resonant call than the other, but as no specimen was obtained apart from one caught in a net and released again as soon as identification was certain, it is impossible to state which sex possessed the loudest, most continuous notes. The other bird, when calling, seemed to utter a half-hearted version of the loud call.

Whilst the nest mentioned above was under construction, one bird roosted at night on the site, whilst the other roosted in a small tree nearby.

Megalaima haemacephala: Crimson-breasted Barbet.

Not very common. One pair was found with a nest in an old tree behind the camp area. Whether eggs were laid and young raised, I do not know, as the nest was never investigated. Barbets were seen entering, emerging or resting with only the head showing through the entrance to the site.

Curiosity made me count the number of times the coppersmith utters his monosyllabic note—204 continuously uttered notes was the highest, whilst three occasions of 121 (one minute duration) and two of 50 (half-minute duration) were noted during the course of one afternoon.

Family: Cuculidae.

Clamator jacobinus: Pied Crested Cuckoo.

One bird each was seen on three occasions—on 24 May, when a solitary bird was seen feeding on a black, hairy caterpillar; on 4 June, when one bird was being mobbed by common mynahs; and a brief glimpse of one on 16 June by the side of the Lalmai-Comilla road.

The birds were silent and as these were the only occasions this species was noted during the period I was in the district, I feel safe in saying that it was certainly not a resident; possibly a straggler or may have been passing through.

Eudynamis scolopaceus : Indian Koel.

The koels were first seen on 18 February, but their calls had been heard on 16 February. On 18 February two males only were seen, whilst the first female noted was on 10 March. These birds were calling up till the end of July, when I left the area.

The male appeared to have a deeper call than the female, and the characteristic call of *Koel* was being vioced by the male whenever I managed to locate the owner of the voice. The 'water-bubbling' call was heard several times, and although I was unable to see the bird responsible, the tone indicated a male. The main call uttered by the female, according to my notes, was the harsh, querrulous *key-key key*.

No actual eggs of koels were ever found, but the normal foster-parents, the Common House Crow, was not breeding in the area where I was stationed. Mention has already been made of the young koels I saw being fed by the Common Mynahs.

The status of these birds was rather difficult to gauge in this area, but I doubt whether more than two pairs were present.

Centropus sineasis or Centropus bengalensis ? Crow-Pheasant (or Lesser Coucal?).

Heard continually from the end of April up till the end of July, when I left the area. One bird was seen on two occasions only, and this was in a small clump of bamboos, after the bird was spotted calling from the tops of one of the trees.

Other cuckoos were present in the district, but I was unable to satisfy myself as to their identification. One might have been the Plaintive Cuckoo, a bird uttering a 'one-two-three-four' call from April to early June, and another was possibly the Common Hawk-cuckoo.

Family : PSITTACIDAE.

Small flights of paroquets were seen on several occasions, once in the area in question, and several times on the Sonamuru side of Comilla, but no firm identifications were made.

FAMILY : CORACIIDAE.

Coracias benghalensis : Indian Roller.

Not very common. One pair at the most were seen, and then mainly in the mixed company assembled whenever the termites were abroad. There was one bird frequently seen haunting the lightly tree-clad hillocks and paddy fields near our camp area during the latter part of June and July.

FAMILY : MEROPIDAE.

Merops orientalis : Common Bee-eater.

Common and fairly plentiful up to February. The numbers then diminished around the camp area and the birds were to be found further afield until May, when family parties were in evidence. In April, six nests were found, one being opened on 22 April which contained six hard-set eggs. Some days later I found a fledging that had strayed from the nest, evidently prior to a shower of rain, as it was almost buried in loose sand some yards from the nest. It was still alive, so I returned it to the entrance, and was pleased to see it scamper away down the hole.

A lot of the bee-eaters were without the elongated central tail feathers both before and after the breeding season.

Large numbers of green bee-eaters roosted in tall bamboos near Lalmai station, and were often seen out hawking insects in fairly large parties towards late evening, although the parties were considerably smaller during the day. They were also among the birds present when the termites were abroad, and were on several occasions seen to take butterflies on the wing, apparently swallowing wings as well as the insects.

Merops superciliosus : Blue-tailed Bee-eater.

Four birds seen once, on the morning of 28 March at 07.15 hours, one hawking insects and three others perched nearby. These were possibly stragglers or on passage, although it is difficult to say, as I neither saw from what direction they came or vanished.

FAMILY : ALCEDINIDAE.

Alcedo atthis : Common Kingfisher.

More common during the rains but not plentiful. Immature birds noted during early June.

Halcyon smyrnensis : White-breasted Kingfisher.

More common than the above species but not plentiful. Most in evidence during the ploughing of the paddy fields and during the rains when the fields were flooded.

Occasionally present with the termite-hunters.

FAMILY : UPUPIDAE.

Upupa epops : Hoopoe.

Only seen from 23 February until last recorded date on 19 April. The greatest number seen were four pairs in a radius of a mile, on 18 March. There is every possibility that under normal conditions the hoopoe would be well represented in this area but intense military activities must have driven quite a lot of birds further afield due to continual disturbances and the erection of numerous buildings in their normal habitats.

FAMILY : MICROPIDAE.

Cypsiurus batassiensis : Palm-Swift.

Common and plentiful. Nests found on the underside of palmyra fronds during May, usually attached to the same fronds as were the Baya weaver nests. The birds were more noticeable during April and May, especially towards evening, when numbers could be seen circling the palmyras, uttering their faint calls.

FAMILY : CAPRIMULGIDAE.

Caprimulgus indicus : Jungle Nightjar.

One specimen obtained on 24 July 1945. The only nightjar seen by me in this area, although possibly overlooked on other occasions. Two parasitic flies of the family *Hippoboscidae* (identified by Dr. Chopra of the Zoological Survey of India as being *Olfersia* sp.) were found among the feathers of the bird a few minutes after it was killed.

FAMILY : ASIONIDAE.

Athene brama : Spotted Owlet.

Two pairs (or one family?) resident in the area, and seen occasionally every month throughout the period I was stationed there.

These owlets were quite often to be seen during the heat of the day, perched motionless among shady branches, but always betrayed their presence by bobbing up and down when conscious of being observed.

Owners of a weird assortment of catcalls and chuckles.

FAMILY : AEGYPIIDAE.

Sarcogyps calvus : Black or Pondicherry Vulture.

Fairly common throughout the period in question, but seldom seen in more than threes or fours.

In spite of their size and pugnacious appearance, these were often successfully put to flight by jungle crows, and frequently attacked by black drongos during the latter's breeding season.

Pseudogyps bengalensis : White-backed Vulture.

Common and plentiful. Always seen in far greater numbers than the preceding species.

Seen on several occasions standing on the ground in groups with wings outstretched, in the manner of cormorants.

FAMILY : FALCONIDAE.

There were several birds of the genus *Falco* seen in the area, but as I am particularly weak as far as the identification of this family is concerned, no mention will be made of any particular type. These birds were by no means common, an occasional bird being seen at widely scattered intervals and only for a few moments, as it beat over the paddy fields.

Haematornis cheela : Crested Serpent-Eagle.

One pair seen on several occasions in flight over the area. At other times, one bird was seen perched in small trees, sometimes calling, but the call was mostly uttered whilst on the wing.

Haliastur indus : Brahminy Kite.

Fairly common, though not seen in more than pairs. Confined mainly to stretches of country where there was water, and consequently more often seen when the paddy fields were flooded.

Occasionally seen among the termite-hunters.

Milvus migrans : Pariah Kite.

Common and plentiful up to the end of May, when most of the birds disappeared. Stragglers were seen into June, but by the beginning of July there were no kites to be seen in the area.

One nest was located in the top of a palmyra, containing an almost fully-grown fledgling on 24 March. Towards the end of April and May, a lot of the kites were noticed with brown and white mottled plumage.

The common pariahs were always in attendance when the termites took to the wing, catching the insect with their feet and carrying it straight to the bill in one continuous move.

Family : COLUMBIDAE.

Columba livia : Blue Rock-Pigeon.

Common and plentiful around the small villages or groups of dwellings in the area. Whether the birds seen were all true blue rock-pigeons, I am in doubt, as nearly all the birds led a semi-domesticated life, and the plumage indicated cross-breeding with other types.

Streptopelia chinensis : Spotted Dove.

Common and plentiful. Two nests, with eggs, were found in early February. Commonly seen on the paddy fields prior to ploughing, and during the rains parties would frequent the grassy patches, feeding on the grass-seeds.

Streptopelia senegalensis : Little Brown Dove.

Fairly common, but not nearly so plentiful as the previous species. Seen further afield, frequenting the paddy fields, but not often seen among the buildings in the camp area.

Family : CHARADRIIDAE.

Lobivanellus indicus : Red-wattled Plover.

Not very common. Seen occasionally on the dry paddy fields nearby during December and January, and later seen more frequently from May onwards. Two pairs were known to frequent a stretch of country along the banks of the Gungiajuri Chara. During June and July, the birds could be frequently heard calling at night.

Family : SCOLOPACIDAE.

Actitis hypoleucos : Common Sandpiper.

Not very common. First seen on 10 February, feeding on the bank of an irrigation tank nearby. On 18 March, a party of nine were seen feeding at the same tank. Last seen on 29 April.

Family : PHALACROCORACIDAE.

Phalacrocorax niger : Little Cormorant.

Seldom seen in the Lalmai area, but noticed several times on the larger irrigation tanks towards Comilla and on the Sonamuru side of the town.

Family : ARDEIDAE.

Egretta garzetta : Little Egret.

Common and fairly plentiful. First seen in breeding plumage on 29 April. Seen more frequently from April onwards, when the paddy fields were becoming water-logged.

Bubulcus ibis : Cattle Egret.

Common and fairly plentiful. First noticed in breeding plumage on 10 April. Seen more frequently and in greater numbers than the previous species, as numerous cattle were grazing behind our camp area, and the herds were invariably attended by at least one cattle egret.

Ardeola grayii : Pond-Heron.

Fairly common throughout the period, but more noticeable from April onwards, that is, at the break of the rains. These birds, during the drier months, were more common nearer Comilla, haunting the regions of borrow-pits and brick fields. The same applies to the Sonamuru side of the Comilla, where irrigation tanks appeared to be more numerous. After the rains started, the paddy fields around Lalmai rapidly became water-logged, and then the pond herons were seen more frequently, although seldom were more than two birds seen together.

Their streaked brownish plumage proved most inconspicuous when the birds were standing motionless.

Ixobrychus cinnamomeus : Chestnut Bittern.

First seen at the beginning of June, when the paddy was established, and the fields water-logged.

These birds were mainly seen before 07.30 hours in the morning and after 17.30 hours in the evening. Their call notes sounded the *kood-kood-kood-kood,* with low, penetrating qualities that proved most difficult to locate, especially when the birds were hidden in the growing paddy.

I saw one bird uttering the above call, perched on an Indian Laburnum. The head of the bird was depressed, the neck having a 'U' kink in it, and the body appeared to be compressed. Between calls it kept alertly turning its head, as if on the look-out for possible danger. During the calls, it moved its head around slightly, lending a ventriloquistic affect to the notes. The 'alarm-call' is a shorter, clipped version of the ordinary call.

Birds were also seen perched on fallen bamboos, but seldom far from the sheltering paddy.

Family : ANATIDAE.

Nettapus coromandelianus : Cotton Teal.

None actually seen in the Lalmai area, although possibly overlooked. On 21 June a male was shot by one of our officers just outside Comilla on the Comilla-Chittagong road, about 5 miles from the township. The officer stated that he saw the pair swimming in a flooded paddy field, but failed to obtain the female.

A FISHING TRIP TO KARWAR AND MALVAN (15TH OCT. TO 10TH NOV. 1946.)

BY

A. ST. J. MACDONALD

(With 2 plates)

A glimpse at India's west coast line south of Bombay, shews, some 240 miles south, the Portuguese port of Marmagoa. Approximately 50 miles north and south respectively are the small coastal towns of Malvan and Karwar.

Karwar. Already written up by various writers for its beauty, bathing beaches, and years ago for its sea-fishing also. It has an eight-room hotel, and is well connected by motorable roads. In fact it has come to be regarded as one of the beauty spots of Western India.

That it has attracted attention was borne out while I was there; a couple had come from Kashmir, another from Delhi, one from Secunderabad, and our two selves from Bombay, all for fishing!

Eight weeks of continuous fishing from September 10th to November 10th produced only 13 fish between us, best 13 lbs. It reads as almost incredible, that one could troll two baits 25 or 30 miles past all the best and reputed places, out as far as 16 miles to sea, day after day, and not connect with fish of some size at a time when the mackerel and sardines were in the bay by the hundred thousand.

Our failure to connect with fish at a place with such a reputation caused me to explore every means at my disposal for a reason: I visited the fish market, the curing yard, and talked to the net and shark fishermen, the lighthouse keeper—himself a keen fisherman with 20 years experience of the rocks around the lighthouse, then got down to the visitors book kept in the hotel and dating back to 1922, where remarks on fishing trips were made by anglers, I also patiently went through packets of chits held by boatmen given by disappointed but cheerful anglers in the past. All of which told the same story,—'Come too early or too late', 'winds not right', 'a bad year', 'not enough small fish in'; these remarks were spread over the period September to December!! Nothing larger than 5 pounds in Surmai were seen in the market or in the curing yard, and the lighthouse keeper had not bothered to fish.

I took counsel with Dr. Suter, probably the best authority on off-shore fishing, and certainly the most experienced on Karwar fishing, who was on a visit to the place collecting butterflies; he has noted a steady falling off yearly of the visits by the larger mackerels, and of recent years only found the fishing in August-September for Bahmin worthwhile.

The one bright spot in this record kept by the hotel is Dr. Rishworth's excellent note, helpful in the extreme with a sketch map of where he connected with fish, how to mount bait, etc. He records 12 days of his visit, which was, I understand, made on a telegram from the lighthouse keeper, Mr. Adam, when he saw the fish had arrived, and must be judged as the height of sport Karwar offers.

Date.	Fish and Weight.	Total Weight.
22 Oct.		
23 ,,	43.	43
24 ,,	0.	0
25 ,,	10.	10
26 ,,	25,8.	33
27 ,,	25,10,8,6.	49
28 ,,	10,12,11,12.	45
29- ,,	0.	0
30 ,,	8,12,10,3,5,12,8.	58
31 ,,	9,8,9,12,18,14.	70.
1 Nov.	0.	0.
2 ,,	8,12.	20.
12 days.	27 fish.	328 lbs.

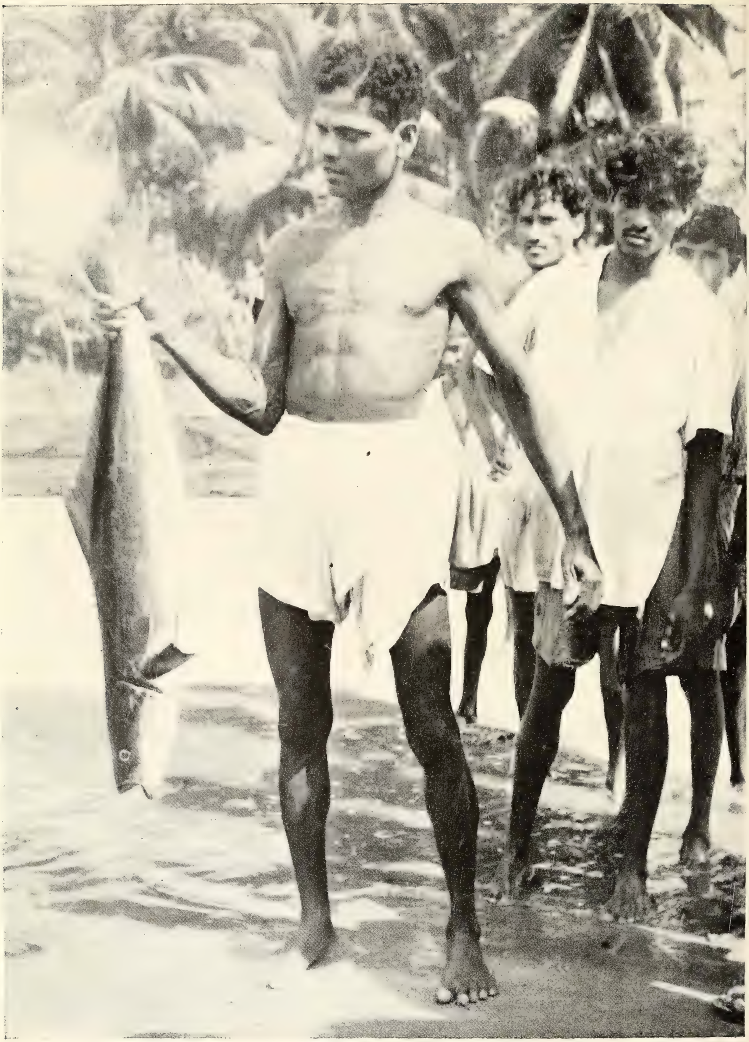
Average weight of fish = 12 pounds.
,, caught per day = 2¼ fish.
Best day 6 fish weighing 70 pounds.

Against this very mediocre sport expenses may be judged. Hotel charges at Rs. 10 a day, boat hire at Rs. 8 a day, with other incidentals such as bait, journey to and from being left out.

Dr. Rishworth works out at 10½ annas—a very satisfactory figure—per pound. Our combined results of 13 fish of 81 pounds in 56 days, or Rs. 11-4-0 per pound.

For those, whose sentiment carries them away for the love of the sea, there are compensations, but for the rest, like myself who visit Karwar for fishing, I can offer no encouragement. The hotel

Bag of Mackerel (*Bangra*) and 20 lb. Queen Fish (*Dagol*).



16 lbs. Black King Fish (*Morousa*).

is a very poor one with food below Dâk bungalow standard, with war time charges, cheap tin butter, and the management unable to provide reliable information, in spite of years of experience and continued and consistent failures, little is known about the habits or conditions or prospects of fishing by either the fishermen themselves or the management or anyone connected with the place.

While I was there the bay was packed with fish, both mackerel and sardines and three square miles of water just rippled with shoals, we counted as many as 50 wolf herring in a minute feeding on these shoals, the boat literally ploughing its way through masses of fish, this state of affairs existed on three occasions while we were there, but there were always shoals present though in smaller numbers. At the lighthouse group of islands where we were most days, we would see shoals passing but unmolested, the same occurred at sea some 16 miles out. During all this time we never once saw a Surmai rise, and Dagol feeding only three times, of which we caught two.

This is the picture of Karwar as seen by us, our total bag being as follows :—

2	Dagol	...	13,11	pounds
1	Kokar	...	4	,,
2	Dog fish	...	5,4½	,,
1	Perch	...	11	,,
1	Bahmin	...	10	,,

4. Wolf-herring 5½, 4, 4, 3 = Total weight 76 pounds.

In contrast to this, of conditions of a few years ago, read Dr. Suter's excellent article in the *B.N.H.S. Journal,* No. 45, part 2, of April 1945.

No records were available of the total weights of fish taken by years, months, or varieties at either Karwar or Malvan.

Malvan.—Here, although we did no good, is a place full of possibility and undoubtably superior to Karwar, being geographically, better situated and practically, more encouraging. We struck it in a cyclone and unsettled weather, but we saw in both the curing yard and cold storage depot, large stocks of surmai, dagol, and kokar or *Caranx,* of 20/40 pounds.

I am sure anglers would connect with these fish in numbers under normal conditions. Statistics available also shew a predominance of the larger mackerel taken in nets, surmai ranking second in weight to the *Bangra* or Indian mackerel, besides which they are all taken within three miles of shore, just outside the submerged reefs of rock shewn in sketch. The fishermen are far better informed than at Karwar and are emphatic that Sail-fish of over 100 pounds appear within five miles of the bay, a dozen or so being taken in a season in the nets.

But the sea is a monster unto its self—winds, tides, currents, storms, are factors no organisation has yet unravelled, even the fishermen (Koknes) seem unable to define the cause or reason of the day to day variations.

I found among the fishermen themselves complete agreement and a keen knowledge of the fishes that occur in their waters and was able with the aid of that lovely publication '*Marine Game Fishes of the Pacific Coast*' by Lionel A. Walford, which is exquisitely arranged and illustrated in colour, to get the local names of most of the Game fishes related, or the Indian forms of the Pacific varieties.

I give below a list of these with such other data as I was able to collect. The scientific names may be incorrect in relation to the local fish in some cases, as I only had Walford's book as a guide, and give the name of the fish appearing on the plate.

English Name.	*Local Vernacular Name.*	*Scientific Name.*
1. Sardine (non-oily)	Pedwa	*Clupea fimbriata.*
2. ,, (oily)	Peri	,, *longiceps.*
3. Horse Mackerel	Kherba Bangra	*Caranx crumenophthalmus*
4. Indian ,,	Bangra	*Scomber microleoidotus.*
5. Wolf-herring	Karli	*Chirocentrus dorab.*
6. Seer or Surmai	Iswan (large) Surmai (small) Hadra (spotted)	No differentiation between *Cybium guttatum* or *Cybium commersonii.*
7. Dagoli or Queen fish	Dagol	*Chorinemus lysan.*
8. Kokar or Kingfish	Kokari	*Caranx.* sp.
9. Black Kingfish	Morousa	*Istiophorus guyi.*
10. Dolphin	Abnus	*Coryphaenidae.*
11. Bluefin	Bugerha	*Thunnidae.*
12. Yellowfin	Gader or Apunsa	,,
13. Albacore	Gurmu	,,
14. Yellowtail L. Jacket	Dayan	*Seriola.*
15. Bigmouth L. ,,	,,	,,
16. Moonfish	Gabah	*Vomer declivifrons,*
17. Lookdown	,,	*Argyreiosus brevoorti.*
18. Snappers or Bream	Tombosa	*Lutianidae.*
19. Gobra or Groupers	Gobra	*Mycteroperca.*
20. Red Rock Perch	Kharki and Tombosa	*Lutianus roseus.*
21. Blue spotted R. Perch	Kadori	*L. argentimaculatus.*
22. Gol or Tatuava	Gol	*Sciaena sina.*
23. Barracuda	Bodarvi	*Sphyracnajello.*
24. Garfish	Tora	*Beloni annalata.*
25. Eels	Wam and Ratan	*Muraena.*
26. Sharks	Musi	*Elasmobranchs.*
27. Sail-fish	Tarousa	*Istiophorus.*

NOTES.

1. Shoals arrive in late September and continue until December.
2. Not so abundant as the Pedwa appearing in smaller quantities during the same period.
3. Arrive in large shoals from Oct. to Dec. and are followed by
4. the larger predatory fish.
5. These are resident all the year round, and can be a menace.
6. Arrive in second half of Sep. and remain until Nov. depending on the run of small fish, when they may be taken half a mile from shore up to 30/40 pounds and as many as 200 in one net haul. We saw evidence of this in the store yards. 460 maunds were cured in 1945, besides which large quantities were shipped to Bombay, Ratnageri and inland of which no records were available.
7. This is a deeper fish than the Wahoo (*Acanthocybium solandri*) of the Pacific or Queen fish of America as illustrated by Walford, which in shape resembles the Surmai.

They start to arrive in Oct. but are most numerous in Nov. and run to 40 pounds. They are not so abundant as Surmai, and taken within 5 miles of shore. The best specimen we saw was about 35 pounds.

8. The Kingfish of the Pacific (*Scomberomorus scerra*) is again built more on the lines of the Seer or Surmai. The Koker is a deep bodied fish more like *Caranx caninus*, known as Jack-Crevally in Walford's book. There are a number of varieties found at Malvan all known as Koker. The best season is stated to be Oct. and early Nov. but owing to their love for reefs they are seldom caught in nets. They run up to 80 pounds, and 50 pounders not uncommon a couple of miles out at sea.
9. The best season is given as Nov. to Jan. but a few are caught up to the end of March. Often taken up to 40 pounds with an occasional one of 70 pounds.
10. Sometimes caught up to 2 feet.
11. }
12. } Fairly plentiful from Sep. to Nov. up to 30 inches.
13. }
16. }
17. } Recognised from Walford's book.
14. Occasionally caught.
15. ,, ,,
18. This is a general name given to all or most of the smaller varieties of Sea Perches.
19. Known also as Rock Cod, appear in several forms and grow to great size.
20. Kharki means rocks.
21. Run large and take a spinning bait, I got one of 11 lbs. They are like Cock-up (Beigti) to eat.
22. Very similar in appearance to Totuava of Walford's book.
23. These are claimed to run up to 4 feet in length, and fairly common.
24. Common throughout the year.
25. There are a variety of these, the largest I saw was 7½ feet.
26. Caught mostly outside the 30 fathom mark.
27. A dozen or so are taken in a season in the large nets inside 5 miles, and claimed to exceed 100 pounds. Are stated to be most numerous in March-April.

This list covers only a very small number of the many varieties caught at Malvan, we counted for instance in one haul of fish 33 species and of which we took a close-up photo, but were unable to identify them in the absence of a suitable book of reference. Let us hope that a publication on marine fishes will soon be published on the lines of Shaw and Shebbeare's *'Fishes of Northern Bengal'* by the Fisheries Department, and made available to the public.

Accommodation and Travel.—There is a daily service run by the Bombay Steam Navigation Co. Ltd. to Malvan with cabin accommodation, the charge being Rs. 24 for a single berth plus Rs. 6-8 a day feeding charges. No drinks or ice available. The boats leave ferry wharf at 10 a.m. arriving at Malvan in the early hours of the morning, and leave Malvan at 11 a.m. arriving at Bombay at 6 a.m. making five calls on the way.

There are two rest houses, one a single-room block on the top of the ridge overlooking the sea, run by the P.W.D. and controlled by the Collector of Ratnagiri. The other is a small two-room bungalow near the jetty run by the District Board and controlled by the President, District Board, at Ratnagiri. Both bungalows have furniture, plates and cooking pots and cutlery but no cook. Nothing is available in the way of tin provisions, not even tin butter, but fowls, eggs, and of course fish and some vegetables and fruit. Bread may be had off the boat by special arrangement. There is a bazaar held daily on the seashore. Both Post and Telegraph offices are near the jetty, but there is no Customs bungalow or rest house, as we were given to believe.

Boats are Outriggers.—The boatmen demanded Rs. 15 a day for a 27-foot outrigger and a crew of 4 men. At Karwar where the price is considered high Rs. 8 will procure a boat and four men as crew.

Information.—Mr. Sauba, Superintendent of the Fish Curing Yard, is a helpful and well-informed person, or Mr. D. D. Malanker, Fish Yard, Malvan, but perhaps the best plan would be to get the Customs Officer to help if a contact could be made in Bombay, especially for the hiring of boats at a reasonable rate.

Jerson DeSousa, the Chowkidar of the District Board Bungalow, is a bright fellow and could be relied on for information in advance.

Tackle.—Take plenty of spoon or spinning bait in case the small fish are difficult to obtain, or late in arriving back with the nets. I was kept waiting until 10 a.m. one morning on this account. The shore wind blows out until about 11 a.m. when it turns from sea to shore so that the distance one can get out to sea depends very largely on the time of leaving in the morning.

Method of Fishing.—These are set out in expert detail by Dr. Suter in his interesting article mentioned elsewhere. I cannot myself claim any results from the methods I employed as I only fished one day, owing to storms, and on this day we had no luck as the small fish had stopped running. With the sail up I trolled with a long line 50 yards from the boat, and 40 or less if near rocks, with oars I reduced by 10 yards in each case.

I also mounted the dead bait to spin as little as possible as per diagram. The ideal trolling speed is held by Dr. Suter as 6 miles an hour, but these outriggers seldom go more than 3 to 5 miles with a sail or 2 to 3 with oars so that very little lead is necessary on the trace. The bait should not sink below 6 feet if fishing for surmai, kokar and the other large mackerel.

200 yards of 36 pound breaking strain is good enough for fish of 50 pounds.

Time and Tide.—Here again I quote Dr. Suter who gives the best times as follows:—(1) From the end of the first quarter of the incoming tide to the beginning of the third quarter, and again (2) from the beginning of the second quarter of the outgoing tide to some time past the half tide. Drift lining or fishing from the rocks will give good fun with the many varieties of bream and perch using bits of fish as bait, when conditions are unsuitable for trolling. We caught an assortment of fish in this way though eels are a nuisance. Wolf-herring and small kokar may also be caught on fly-spoon which is good fun at times.

General.—I have included three sketch-maps of the two places which may prove useful to future anglers to mark in good spots as and when found.

Two main types of nets as used at Malvan; a 5-inch mesh called 'Dhangad' for the larger fish, and a half-to-one-inch mesh called 'Rampan' for the migratory shoals of mackerel and sardines.

Ice is available from an obliging manager of the Indian Fisheries Cold Storage Depot at 1 anna a seer.

Conclusion.—I have dealt with Malvan in more detail than Karwar, chiefly because I consider it a more promising and suitable place and because Karwar has already been dealt with by Dr. Suter.

Sailfish.—Since returning from Malvan I have heard in reply from Dr. Suter in connection with the sailfish information contained in this note, which will be of interest to all anglers. This is what he writes:—

'Glad to learn that your impressions of Malvan as a fishing place tallies with mine.

As for sailfish I am greatly surprised at any having been taken so close in as 5 miles. When I was there the men mentioned 15 miles as the distance one would have to go out to meet them. This would tally with my experience of seeing them from steamers at 16 to 17 miles out from Malvan and Jaigarh.

Perhaps the men are a little vague about distances, or it may have been an exceptional occurrence. Really it is not a matter of off-shore distance but of *depth.* In Ceylon we reckon 50 fathoms to be the depth of the waters where all these big fish habitually live, or rather 50 fathoms or more. This of course does not mean that you cannot meet with some in waters of 30 fathoms. As a matter of fact I hooked one off Barbryu island in 15 fathoms, but was told by all the senior members that this was quite exceptional.

I have read a lot of American fishing books and they all favour the idea that these fish hardly ever venture into shallow coastal waters being fish of the deep and blue sea. Still something exceptional does happen now and then.

If I had a 25-30 foot seaworthy motor cruiser I would certainly take it to Malvan and Jaigarh for a spell and have some fun.

You mention the Malvan men having caught sailfish in March. This coincides with my experience inasmuch as I saw sailfish and marlin from steamers off that part of the coast in February and March on two occasions.'

NOTES ON THE FERNS AND FERN ALLIES OF MURREE HILL

BY

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(*With* 12 *plates*)

The plants have been collected from a small area only. This area forms a small part of the uncultivated mountainous wedge of the outer Himalayas. Murree, the most important military hill station, and the summer resort of Northern India, is situated on top of this wedge. The three important European schools of the Punjab, namely, the Lawrence College, Ghora Gali, the Convent of Jesus and Mary, and St. Denys' School, are situated on this wedge. The area varies in height from 5,459 ft. (Murree Brewery) to 7,413 ft. (Kashmir Point) above sea-level.

The study of previous records shows that no attempt at systematic collecting and studying ferns from this important area has been made in the past. E. W. Trotter collected ferns from the neighbouring district of Hazara during 1887-1892. He also collected a few ferns from Murree, and the total recorded number is seven. The area is fairly rich in ferns, and the author has collected 17 ferns and 2 fern allies from this locality.

The author is greatly indebted to Miss Watson and K. Thyer for their kindness in illustrating the specimens and to Mr. P. N. Mehra, of the Botany Department, Government College, Lahore, for his generous help in identification.

The area is two-faced as regards distribution of vegetation. The eastern face is dry, with scanty undergrowth, but the western face is shady, dampish, with dense undergrowth. The trees in this area show an altitudinal zonation in their distribution. From Murree Brewery (5,459 ft.) to Pindi-Point of the Murree station, the commonest trees are 'Chil' pine (*Pinus longifolia*) and the blue pine (*Pinus excelsa*). In the Murree station area (7,237 ft. to 7,134 ft.) one meets with typically English trees such as horse chestnuts, willows, maples, elms and hill poplars. Further on to Kashmir Point (7,413 ft.) the tall spruces (*Picea morinda*) form a distinguishing landmark. The ferns and fern allies also exhibit a similar altitudinal zonation in their distribution in this area. For example, though some of the species such as, *Asplenium alternans, Adiantum venustum, Pteris cretica, Dryopteris odontoloma* are generally met with all over this area, the other species are, as a rule, confined to special altitudinal zones. The following species are commonly met with between the Murree Brewery and the Lawrence College area (5,000 to 6,000 ft.), namely, *Adiantum caudatum, Pellaea nitidula, Cheilanthes farinosa,* and *Adiantum capillus-veneris*. The following are met with between the Lawrence College and the Pindi Point (6,000 ft. to 7,000 ft.) namely, *Cheilanthes albomarginata, Equisetum debile* and *Selaginella chrysornizos*. Stray specimens of *Asplenium varians, Asplenium trichomanes, Adiantum capillus-veneris* and *Onychium japonicum* are also found. The following occur in the Murree station area, namely, *Asplenium varians* and *Cystopteris fragilis*. The following species are found in the area beyond this, namely, *Polystichum angulare, Cheilanthes dalhousie, Athyrium Schimperi, Coniogramme fraxinea, Asplenium varians, Asplenium trichomanes* and *Onychium japonicum*.

The ferns are generally known to a layman. They are shade loving plants and grow on shady slopes, or along the banks of 'Nullas'. All the ferns in this area are terrestrial. No epiphytic species are found. The stem is generally underground, and is called the rhizome (Plate 6, R.) The size of the rhizome and its position in the ground differs in different species. The visible part of a fern generally consists of leaves, of which a number unfold each year. Before unfolding the young leaves are coiled at the top like a watch spring. The stalk or the stipe (st) of a fully developed leaf bears scale-like leaves in some species. The shape of the leaf blade or frond differs in different cases. During certain times of the year certain fronds bear on their under surface, certain structures called the Sori (S). These sori are brownish in colour when mature, and generally possess a protective covering called the indusium (D). The shape, size and the position of the sori differ in different species. Each sorus consists of a number of stalked capsular bodies known as sporangia. Many small unicellular bodies called the spores are developed within each sporangium. When a sporangium matures, it bursts, and the spores fall to the ground, and germinate into a small, flat, greenish independent structure called the prothallus. The reproductive organs, namely, the archegonia or female organs, and the anthridia, the male organs are developed on this new structure. The egg in the archegonium is fertilised by the motile spermatozoid produced in an anthridium, and the egg then develops into a new fern plant. In the life-history of a fern, therefore, one meets with two distinct plants or generations, namely, the main plant bearing sori, and called the sporophyte, and the prothallus bearing the gametes or sex cells, and called the gametophyte. The sporophyte produces the gametophyte, which in its turn gives rise to a new fern plant or sporophyte. This is known as 'alternation of generation'.

Genus: ASPLENIUM. L.

(Deriv. A, Primitive; splen, spleen—referring to the medicinal properties of these ferns).

KEY TO THE SPECIES.

A. Fronds thick, and regularly cut into lobes. Sori linear.	... *Asplenium alternans.*
B. Stipes black and needle-like. Fronds pinnate. Sori oblong to linear.	... *Asplenium trichomanes.*
C. Stipes grooved. Fronds pinnate. Pinnules deeply lobed. Sori oblong.	... *Asplenium varians.*

1. **Asplenium alternans** Wall.

(Plate 1, figure 1).

It is very common, and can be collected throughout the year. The rhizome is short, and bears numerous long roots. The short stipes are covered over with dark brown, hair-pointed scales. The fronds are thick in texture, pale green, and deeply and regularly lobed. Each lobe is broad at the base. Practically all the fronds bear sori, which occur in two rows, and are linear. The veins are clearly seen, and end freely.

Previously collected from Murree by Dr. Fleming.

2. **Asplenium trichomanes** Linn. The 'Spleen Wort'.

(Plate 1, *figure* 2).

This is a very rare fern. It grows in sheltered spots among tree roots, or under projecting rocks. The short rhizome bears long and slender roots, and old stipes. The needle-like stipes are black and polished. The fronds are pinnate, and the pinnae occur in nearly opposite pairs. Sori are oblong to linear, and are generally placed close together. Specimens can be collected from the forest road below St. Denys' School.

3. **Asplenium varians** Hook and Grev.

(*Plate* 2, *figure* 3).

This is a very common fern, and grows in rock crevices in shady places, or between stones of retaining walls. It persists throughout the year. The rhizome is short. The stipes are slightly grooved, and bear in some cases, a short brownish line along one side. The semi-erect fronds are delicate in texture, and pale green in colour, and pinnate. The pinnules are lobed. The sori are oblong. Specimens collected from exposed sunny spots are thicker in texture and greenish in colour.

Previously recorded as under.—Hazara. From Black Mountains eastward to Murree, 7,000 ft. to 9,000 ft. Duthie, Oertal, Trotter, Leaving, Hope and Duthie collector.

Note.—Asplenium adiantum-nigrum L. has been recorded as collected from Murree by Leaving (7,000 ft.), but has not been seen by the author.

Genus: CHEILANTHES Swartz.

(Deriv: Greek cheilo, lip; anthos, flower—referring to the marginal position of the sori).

KEY TO THE SPECIES.

A. Fronds bipinnatifid. Scales very narrow and pointed. Fertile fronds green above and white underneath.	... *Cheilanthes albomarginata.*
B. Fronds bipinnatifid, and all alike. Under surface covered with yellowish powder. Scales narrow and pointed.	... *Cheilanthes farinosa.*
C. Fronds bipinnatifid. Scales broad. Undersurface always without any powder.	... *Cheilanthes Dalhousie.*

4. **Cheilanthes albomarginata** Clarke.

(*Plate* 2, *figure* 4).

It generally grows in dry and exposed sunny places between rock crevices, and curls up when dry. The rhizome is compact, and bears many old stipes. The stipes are dark brown and stiff, and bear a few narrow and pointed scales. Fronds are bipinnatifid, and the basal pair of pinnae long and hanging. Young fronds are light green in colour, but the colour of the fertile fronds is deep green above, and whitish below owing to a coating of white powder. The sori are round and marginal. The indusium is formed by the changed and reflexed margin of the pinnule, and is not continuous.

5. **Cheilanthes farinosa** Kaulf.

Specimens of this fern have been collected from the exposed sunny side of the ridge below the Lawrence College Hospital (5000 ft.

to 6,000 ft.). It does not grow above this zone. The rhizome is stout. The stipes are reddish brown, stiff, and bear narrow, pointed scales. The fronds are light green in colour, bipinnatifid, and all alike. The basal pair of pinnae are longer and hanging. The undersurface in all the fronds is coated with a yellow powder. The sori are round, and lie under the uneven indusium formed by reflexed margins of the pinnules.

6. **Cheilanthes Dalhousie** Hook.

Syn. *Cheilanthes farinosa* Kaulf. var. *Dalhousie* Hook.

It grows in shady places between stones of retaining walls round Panch Pando Park near Kashmir Point. The rhizome is short and compact. The stipes are long, dark brown, and bear broad scales at the base. The fronds are bipinnatifid and are never covered with powder. The sori are marginal, and are protected by an almost even indusium.

Note.—The following species has been recorded before, but has not been seen by the author:—

Cheilanthes fragrans Webb and Berth. Between Murree and Kohala, Leving, 1875.

Genus : Pelleae.

7. **Pelleae nitidula** Wall.

Specimens have been collected from the dry eastern face of the ridge below the College Hospital (5,000 ft. to 6,000 ft.). It does not grow above this zone. It generally grows under projecting rocks. The rhizome is short and stout, and bears numerous old stipes. The stipes are dark brown in colour, and bear a few narrow pointed scales and hair. The fronds are dark green, thick in texture, bipinnate below, and almost pinnate above. The sori are situated in a continuous line round the edge of the pinnules and are protected by a membraneous, and slightly wrinkled indusium.

Genus : Adiantum L.

(Deriv. Greek *Adiontos*, dry. Drops of water do not stay on the fronds).

Key to the Species.

A. Rhizome long and creeping. Fronds 3-4 pinnate. Stipes thin and polished.	... *Adiantum venustum*.
B. Rhizome long and creeping. Fronds 2-3 pinnate. Stipes long and naked.	... *Adiantum capillus-veneris*.
C. Rhizome short. Fronds pinnate, often rooting at the top. Stipes hairy.	... *Adiantum caudatum*.

8. **Adiantum venustum** Don.

(*Plate* 4, *figure* 7).

This is a common fern, and is often sold in pots by the villagers during summer. The plants die down during winter. The rhizome is thin and creeping. The stipes are black, thin and polished. The fronds are bluish green in colour, and 3-4 pinnate. Some pinnules bear one or two marginal sori, which are small and protected by an indusium formed by the reflexed margin of the pinnule

9. **Adiantum capillus-veneris** L. The true Maiden-hair.

(*Plate* 5, *figure* 8).

This is a moisture-loving fern, and grows between stones in the bed of a stream or near in trickling water near a natural spring. The rhizome is long and creeping. The stipes are thick, polished and black in colour. The fronds are 2-3 pinnate, and each ends in a short terminal pinna. The pinnules are fan shaped, and with deeply loped margin. The sori are many and marginal. The indusium is formed by the reflexed margin.

10. **Adiantum caudatum** L.

(*Plate* 3, *figure* 6).

Specimens of this fern have been collected from the dry eastern face of the range below the College Hospital (5,000 ft. to 6,000 ft.). It does not grow above this zone. The rhizome is small. The stipes are short and hairy, and brown in colour. The fronds are pinnate, and lie on the ground. The upper pinnae are reduced in size, and absent from the tip which generally roots in the ground. The oblong sori are developed along the upper edge.

Genus : ATHYRIUM

11. **Athyrium Schimperi** Moug.

Syn. *Athyrium filix-foemina* var. *polyspora* Clarke.

(*Plate* 6, *figure* 9).

This fern is not very common. Plants have been collected from the bank of the 'nulla' behind the Hill Lodge near Panch Pando Park. The rhizome is creeping and branched. The stipes are thick and grooved. The fronds are large, drooping, pale green in colour, and generally bipinnate. The pinnules have serrated margin, and are deeply lobed. The sori are curved, and the indusium is membraneous. The plants die down during winter.

Genus : CONIOGRAMME

12. **Coniogramme fraxinea** (Don) Diels.

Syn. *Syngramme fraxinea* (Don).

(*Plate* 7, *figure* 10).

This fern generally grows under bushes along the banks of 'nullas'. Specimens can be collected from the forest road below St. Denys' School. The plants grow to a fairly large size. The rhizome is long and creeping. The stipes are thick. The fronds are generally bipinnate. The basal pinna is bifid in many cases. The large pinnules are entire, with hairy undersurface and serrated margin. The sori are linear, branched, and look like thin dotted lines along the veins, but not reaching the margin.

Genus: PTERIS

13. Pteris cretica

(*Plate* 8, *figure* 11).

This is a common fern and generally grows in beds. The rhizome is creeping and bears numerous old stipes. The stipes are long, stiff and naked. The fronds are of two kinds. The sterile fronds are pinnate, with the basal pinna generally forked. The upper pinnae are broad and sessile. The fertile fronds, which stand erect, have narrow pinnules, and bear sori in a continuous line near the margin. The indusium is formed by reflexed margin of the pinnule.

Genus: DRYOPTERIS

14. Dryopteris odontoloma (Moore).

Syn. *Nephrodium odontoloma* (Moore) Hope.
Lastrea filix-mas v. *odontoloma* (Moore) Bedd.

(*Plate* 9, *figure* 12).

This fern is found all over this area, and practically throughout the year. The rhizome is short and compact. The stipes bear a few brown scales at the base. The fronds are bipinnate, and pale green in colour. The round sori are developed on the veins. Collected before by Trotter 1889, Hope 1882, 5,000 ft to 7,000 ft. Murree.

Genus: POLYSTICHUM

15. Polystichum angulare Willd.

Syn. *Aspidium angulare* (Willd) Hope.

(*Plate* 10, *figure* 13).

This fern is not very common. Specimens can be collected from the forest road below St. Denys' School. The rhizome is thick and compact. The stipes are short, stout and clothed with dark brown scales. The fronds are dark green in colour, scaly and bipinnate. The pinnules have short stalks and almost spinous margins. The sori are rounded.

Genus: CYSTOPTERIS

16. Cystopteris fragilis Beruh. The 'Bladder fern'.

(*Plate* 11, *figure* 14).

This is a delicate fern, and grows between rock crevices. Specimens can be collected from near Panch Pando Park. The rhizome is short, and bears long, fibrous roots. The stipes are grooved, delicate and flaccid. The fronds are pinnate, thin in texture and pale green in colour. Each pinna is deeply lobed, and bears many and almost marginal, rounded sori.

Genus: ONYCHIUM

17. Onychium japonicum Kunze.

(*Plate* 12, *figure* 15).

This fern is quite rare. It grows in shady places between rock crevices or on shady slopes. The rhizome is slender and creeping. The stipes are wiry and naked. The fronds are thin in texture and profusely divided into many acutely bifid segments. The veins are forked. The sori are linear and the indusium is membraneous.

Note.—The following species have been recorded from Murree as locality before, but they have not been seen by the author in this area:—

A. *Asplenium polypodiodes* Mett. Syn. *Diplazium polypodiodes* Mett. Beddome—Burree, 7,000 ft., Trotter.

B. *Nephrodium ramosum* Hope. Syn. *Dryopteris ramosum* Hope. Between Abbotabad and Murree, 7,000 ft. to 8,500 ft. Frequent. Trotter 1888-1889.

Genus: SELAGINELLA

18. Selaginella chrysorhizus.

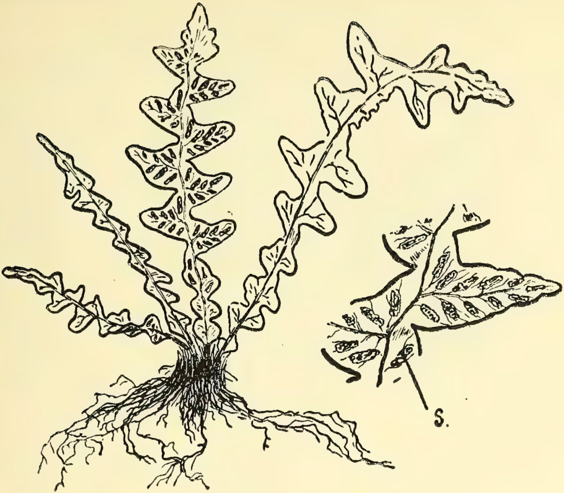
(*Plate* 12, *figure* 16).

This is one of the fern allies met with in this area. The plants grow in beds and can be collected from the shady slope behind the Convent of Jesus and Mary. They are confined to that area. The plants are light green in colour. The roots are slender and bear tubers. They dry up before winter sets in, and the underground tubers grow into new plants each year. The stem is delicate and branched. It bears four rows of leaves. The leaves in the outer row are bigger than the leaves in the inner row. Some branches bear sporangia in the axils of the upper leaves.

Genus: EQUISETUM

19. Equisetum debile. The 'Horse Tail'.

This is the second fern ally found in this locality. Specimens can be collected from the banks of the 'nulla' below the Chelmsford Training College, Ghora Gali. The plants appear to be confined to that locality. That rhizome is thin and bears a number of shoots each year. The surface of these shoots is grooved. The leaves are reduced to scale-like structures and arise in the form of a more or less united whorl from each node. Secondary branches also arise in a whorl from some nodes. They grow out through the sheath of the scale leaves. The sporangia are developed at the tip of some branches, and are grouped together to form a cone-like structure.



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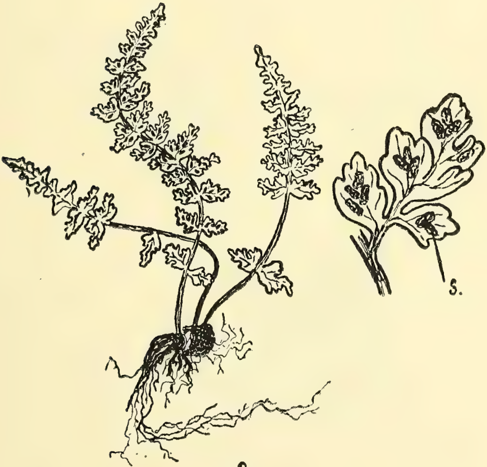

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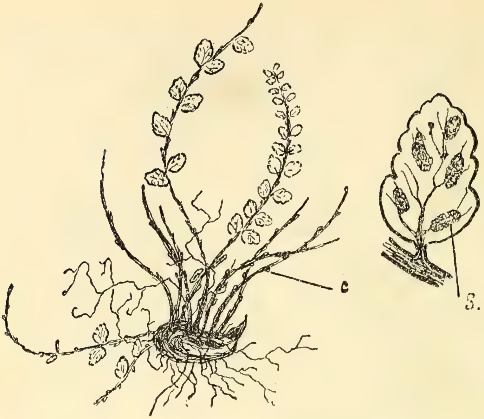
Ferns and Fern Allies of Murree Hill.
(For explanation see end of article).



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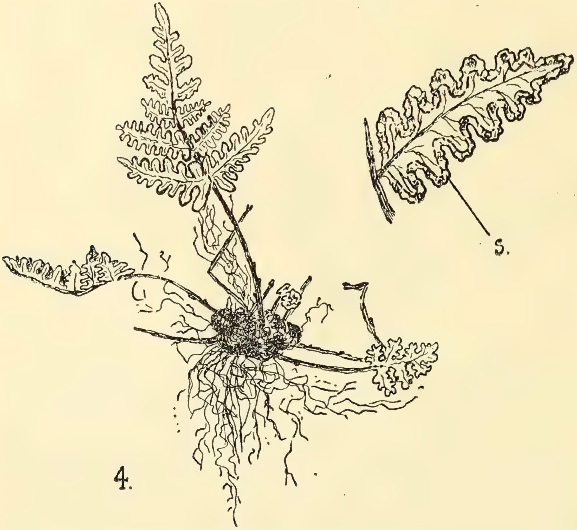

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Ferns and Fern Allies of Murree Hill.

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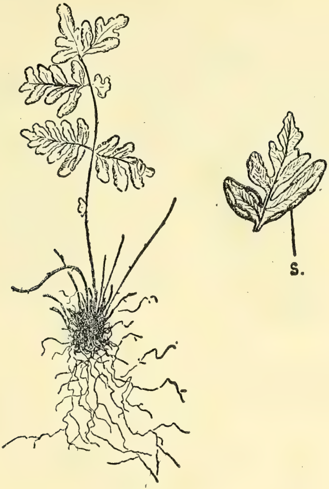

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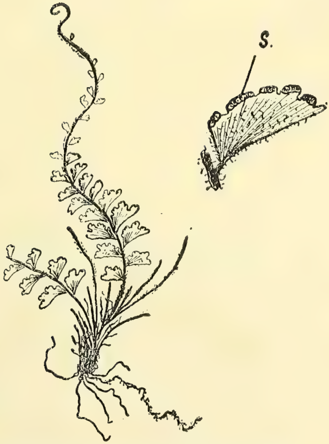

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Ferns and Fern Allies of Murree Hill.

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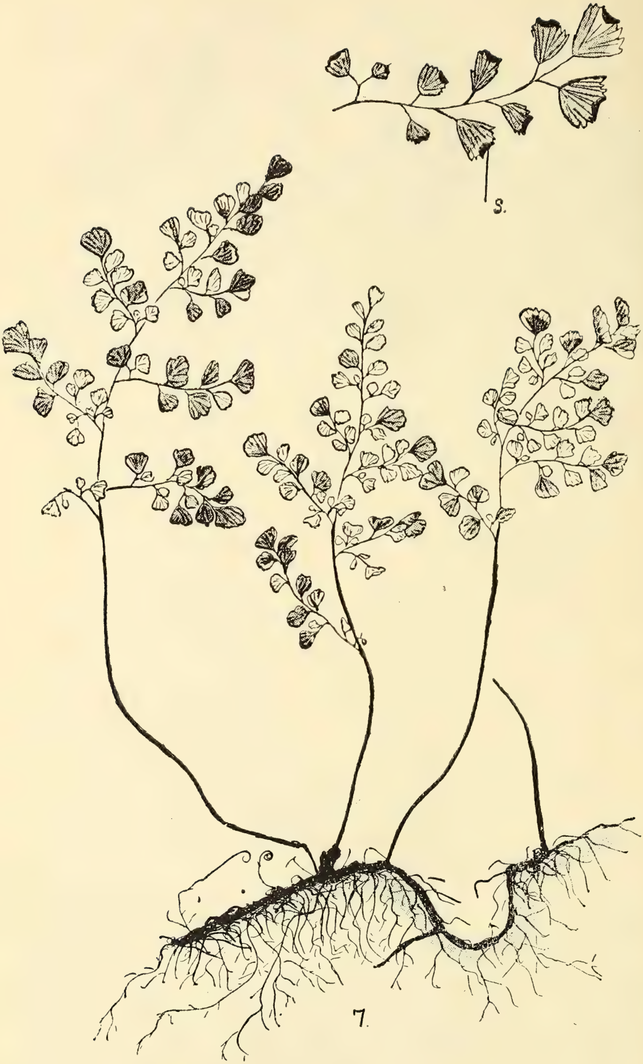
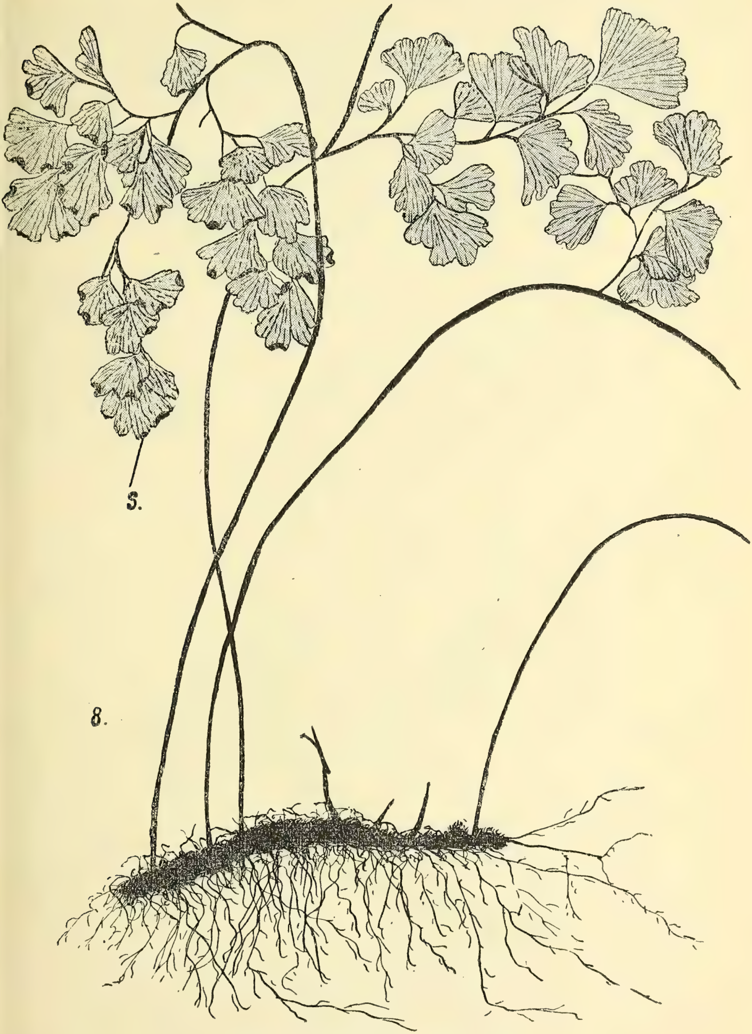


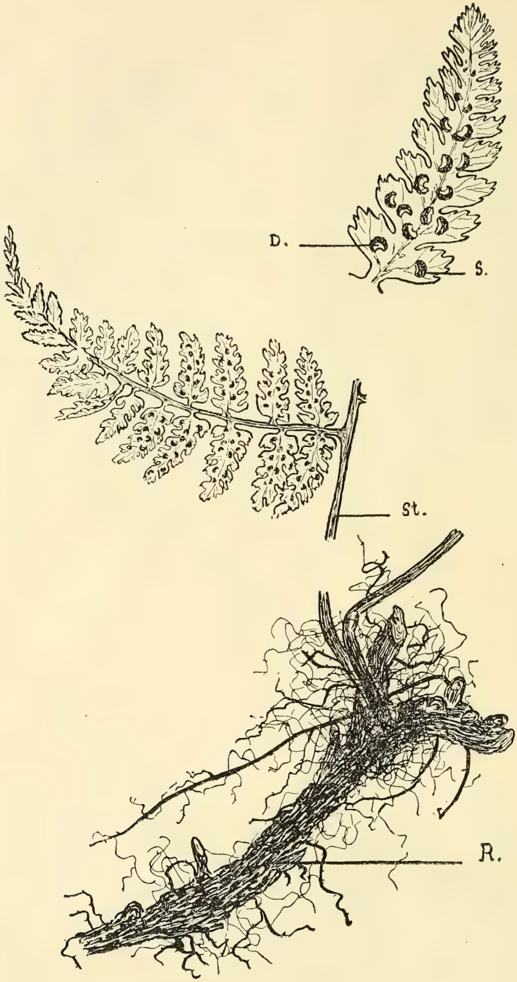
Ferns and Fern Allies of Murree Hill.

(*For explanation see end of article*).



Ferns and Fern Allies of Murree Hill.

(For explanation see end of article).



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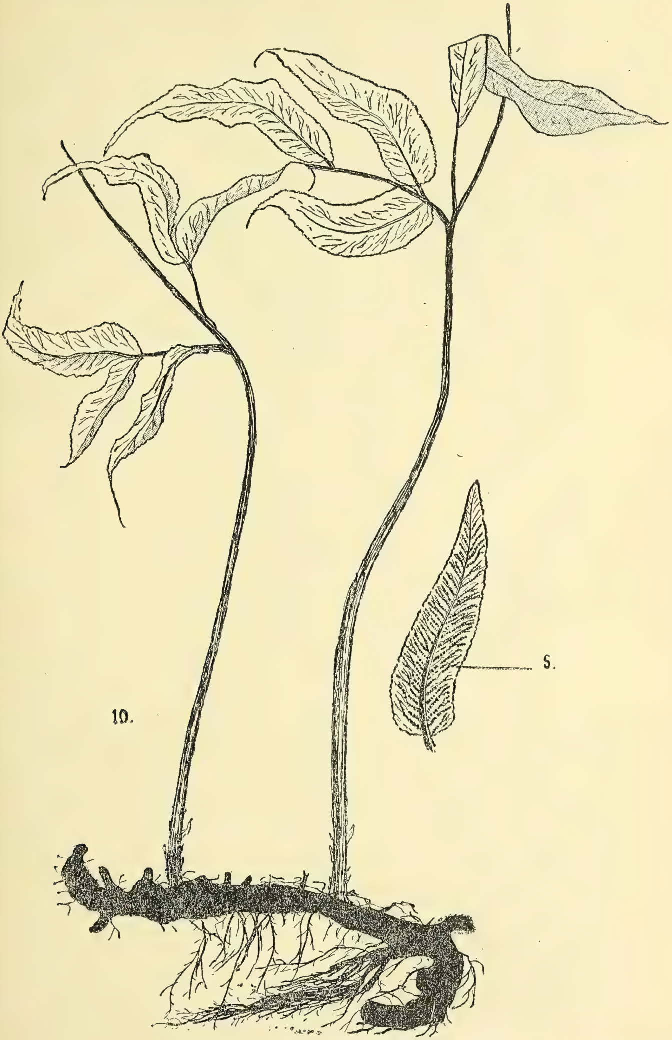

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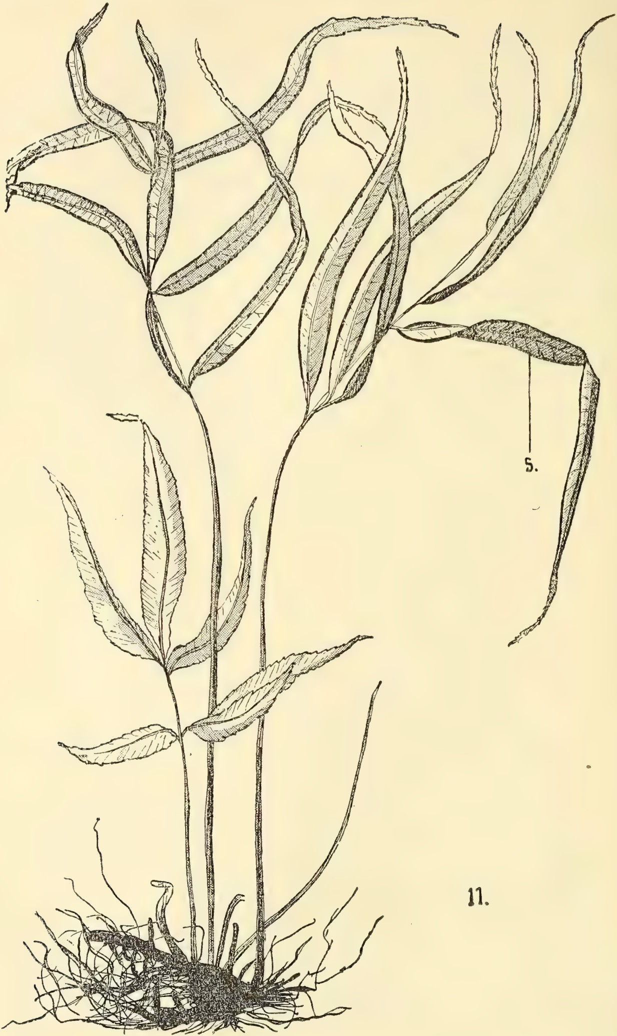

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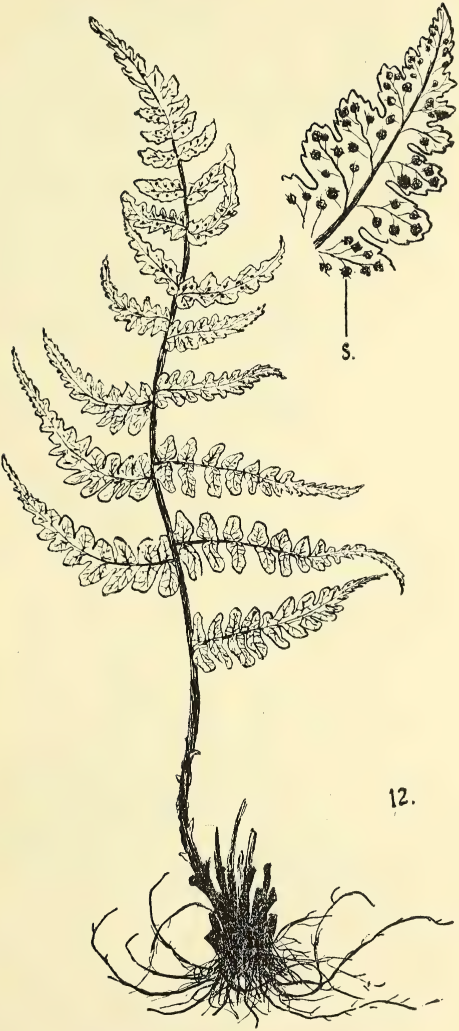

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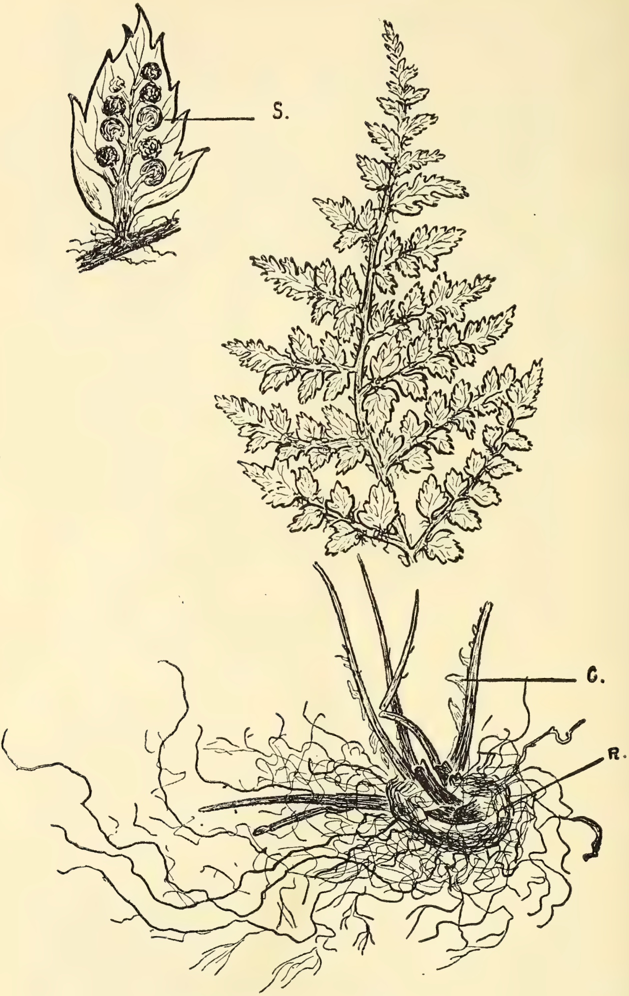

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Ferns and Fern Allies of Murree Hill.

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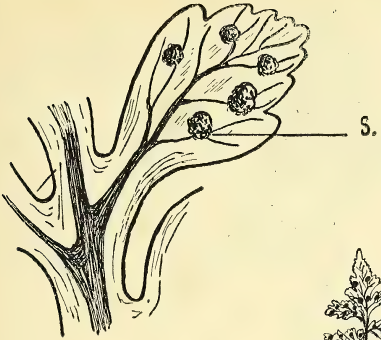

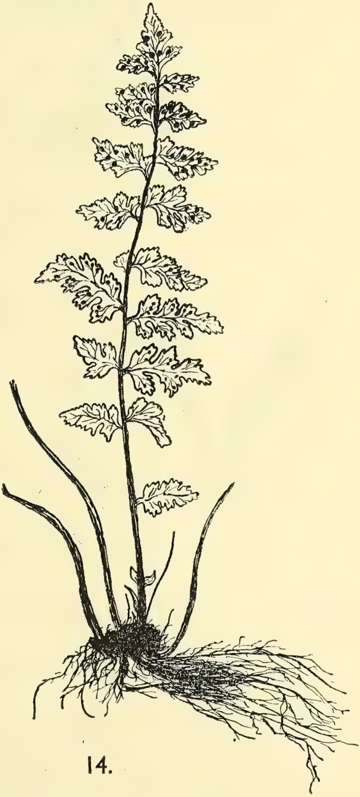
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Ferns and Fern Allies of Murree Hill.
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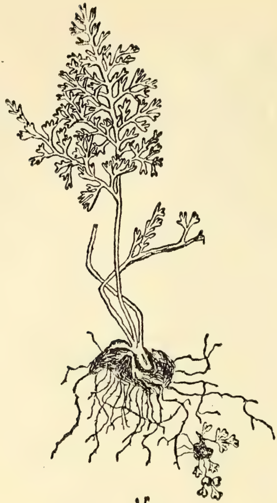

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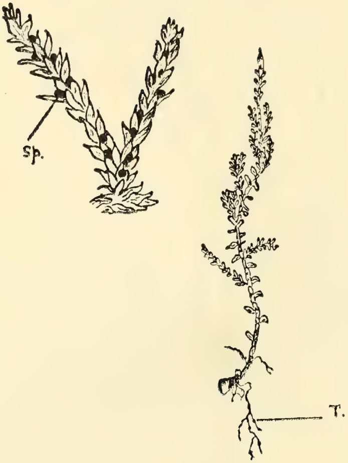

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Ferns and Fern Allies of Murree Hill.
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EXPLANATION OF PLATES.

PLATE I

Fig. 1.—***Asplenium alternans.*** Entire plant and portion of a frond showing sori (S).

Fig. 2.—***Asplenium varians.*** Entire plant and a pinna showing sori (S).

PLATE II

Fig. 3.—***Asplenium trichomanes.*** Entire plant and a pinna showing sori (S).

Fig. 4.—***Cheilanthes albomarginata.*** Entire plant and a pinna showing sori (S).

PLATE III

Fig. 5.—***Pelleae nitidula.*** Entire plant and a portion of a frond showing sori (S).

Fig. 6.—***Adiantum caudatum.*** Entire plant and a pinnule showing sori (S).

PLATE IV

Fig. 7.—***Adiantum venustum.*** Entire plant and a portion of the frond showing sori (S).

PLATE V

Fig. 8.—***Adiantum capillus-veneris.*** Entire plant. Sori (S).

PLATE VI

Fig. 9.—***Athyrium schemperi.*** R. Rhizome. St. Stipes. S. Sori, D. Indusium.

PLATE VII

Fig. 10.—***Coniogramme fraxinea.*** Entire plant and a pinnule showing sori (S).

PLATE VIII

Fig. 11.—***Pteris cretica.*** Entire plant. Sori (S).

PLATE IX

Fig. 12.—***Dryopteris odontoloma.*** Entire plant and a portion of a pinna showing sori (S).

PLATE X

Fig. 13.—***Polystichum angulare.*** Showing rhizome (R). Scale leaves on stipe (C). A portion of a frond. A pinnule bearing sori (S).

PLATE XI

Fig. 14.—*Cystopteris fragilis.* Entire plant and a portion of the pianna showing sori (S).

PLATE XII

Fig. 15.—*Onychium japonicum.* Entire plant.
Fig. 16.—*Selaginella chrysorhizus.* Entire plant bearing tubers (T), and a branch showing sporangia (sp).

A BIRD PHOTOGRAPHER'S MUSINGS FROM KASHMIR

BY

LT.-COL. B. T. PHILLIPS

PART III

(*Continued from Vol.* 46, p. 500).

Birds of a Srinagar Garden

(*With* 6 *plates*).

Srinagar boasts many large-sized gardens enclosed in the compounds of the European quarter. They are havens of peace and charm; the lofty graceful poplars, the ancient mulberry with its gnarled trunk, the stately chenar, all provide ample shade from the rays of the summer sun; the soft green of its well-kept lawns, the flowering shrubs, ablaze with scented blossom, the kaleidoscopic effect of its extensive and well-ordered flower beds resplendent, at this time of the year, with worthy specimens of most of those flowers, the pride of a gardener in England, forms but a tithe of their beauty.

Most gardens find space for a vairety of fruit trees; these enclosures in the early Spring are a riot of delicately-hued almond, apple, peach and other varieties of fruit blossom: these orchards forming later a favourite venue for a wealth of bird life.

These cool and peaceful surroundings are further brightened by the passing to and fro of a stream of birds that impose themselves on the view, their colour, calls and song demanding attention.

Mention must also be made of a few of the more striking species commonly seen at all times during the summer months: the Oriole, in its black and gold, with a bill full of fine grasses flies through the far-stretching branches of the broad-leafed Chenar, and is traced to its cradle nest stretched across the outermost fork of a slender branch; the beautiful male Paradise Flycatcher, either in chestnut or snowy white attire, with its restless fussiness, will be seen giving a display of adroit flycatching; the confiding Tickell's Ouzel of sombre garb, but in a measure, enchanting voice, will surely be hopping about the lawn either digging for a worm or standing erect inanely looking into space; that striking bird the Hoopoe also will be constantly in view busily quartering the lawn, probing for grubs and worms with its long slender bill and occasionally will show the glory of its fully expanded crest.

The particular garden forming the hunting ground described in this chapter, not only gave shelter to a host of passing migrants but also provided breeding sites annually for at least fifteen species of birds. Many halcyon days were spent in these peaceful surroundings with camera clicking at short intervals in an endeavour to portray a graceful form or record some interesting antic characteristic of the species being studied.

With succulent fruit ripening in due season, the fruit eaters are also in their element; although at first much hustled by the paid urchin, set in the centre of the orchard to scare them away, they soon sum up the situation and decimate the crop. The normal contraption used as a 'scare', is a product on a 'no cost' basis—an old empty tin with its clapper of rock, hung from a tree in the centre of the plantation, is spasmodically worked by the lad pulling at an attached rope: at first the clanging disturbs the birds, but this only for a few hours, after which the rattle seems to be summed up as of nuisance value only, even to the extent that, while the din is on, they will busy themselves on the far side of the trees. The inevitable and numerous bouts of 'forty winks' indulged in by the custodian are patiently awaited in order to work undisturbed havoc on the fruit. Continued bird watching convinces me that examples of such bird behaviour show signs of definite reasoning power and cannot be solely attributable to instinct.

While meditating over these things, the pipe of a passing little Kingfisher attracted my attention, its swift low flight carried it to a perch on a twig protruding from a plum tree and overhanging a fairly deep disused manure pit containing a certain amount of rank water. The following up of a bird that acts contrary to habit often provides interesting discovery. In this case with silvery minnow in bill seemingly 'at home' in a garden at a distance of half a mile from any known lake or stream, called for investigation. Soon a second Kingfisher emerging from this pit joined its mate on the plum tree, where, with a flirting of wings and *ch'hee-ing* the fish was ceremoniously handed over and duly swallowed by the new comer. Closer approach led to the discovery of the nesting tunnel in the bank, an unusual site for the nest of such a fresh-water loving bird.

The nesting of this beautiful little bird alongside the gorgeous Golden Oriole and Hoopoe recalls to mind another occasion when these three species had nested together in close proximity the previous year; the story and its reactions may be worthy of note.

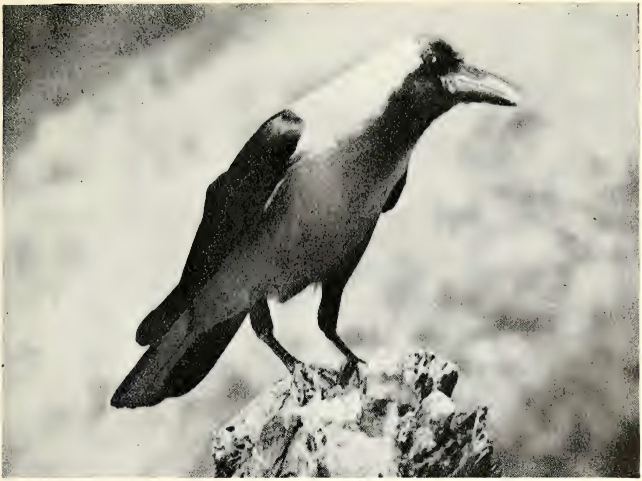
With houseboat moored in a nallah at Shalibug on the R. Sind I had just packed up my apparatus, having successfully taken a series of pictures of this Kingfisher from the dining room window of the boat, and having seated myself down on its roof for a sundowner, began reading a well-known English sporting paper: in it a letter to the Editor asked for due approval for the rare achievement of having seen during the season in the neighbourhood of his west country home—the Golden Oriole, Hoopoe and Common Kingfisher! As has already been stated, the Kingfisher had been photographed—the next on the list was a series of the Golden Oriole at home in the willows alongside, and to be taken from the roof of the houseboat next day; across the narrow stream, in the roots of a mulberry on the opposite bank, and not twenty-five yards from the anchorage, a Hoopoe was brooding its six fresh eggs. This anecdote has not been included as a comparative achievement but in praise of Kashmir as a bird lover's paradise.

After this digression let us return again to the burrow pit, where an interesting and instructive half hour was spent in watching the area. This half hour supplied sufficient material eventually to produce a veritable harvest of bird photographs. The very branch used by the Kingfisher was used in rapid succession by both male and female Paradise Flycatcher, the White-cheeked Bulbul, a Warbler and a Sparrow. There is undoubtedly a definite route to each nest which contains a series of perches—in the case of the Kingfisher, the branch was the final jumping off post for the nest; the Paradise Flycatcher used it as a springboard to swoop down and capture the gnats and flies attracted by the rotting vegetation and stagnant water; the others happened to be passers by and taking advantage of a quiet drinking pool.

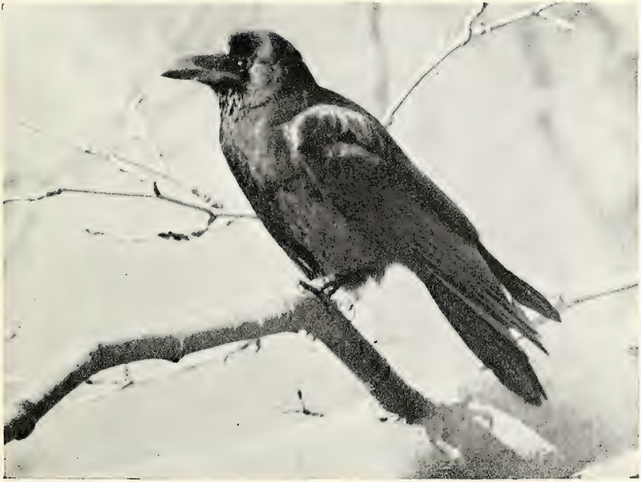
This introduction to the birds of a Srinagar garden cannot end without mention of its avian choruses, though these admittedly do not compare in quality with those heard in England on a Spring or Summer's day—the sound of the intermittent calls of the Cuckoo does create a homy atmosphere and recall many glorious days spent in pastures fair—yet the local choruses are worthy of record. Tickell's Thrush is the main songster in these parts and is the first to commence its sweet but somewhat sad singing in the grey dawn, when, uninterrupted, these fresh and bracing notes trill on the morning air; it is not until this extended concert subsides that a babel of call notes run riot and mark the general 'Reveille' in Birdland. Although there is a distinct decrease of song during the day, the avian world once again bristles with activity towards evening with Tickell's Thrush again the outstanding performer. At sunset the Bulbul joins in with the Thrush, while both are searching out their perch for the night and set up a scolding and mournful twitter as if to bewail the end of a perfect day; having found a suitable perch, and before the hoot of the Owl, the Thrush once again pours forth its delightful evensong to herald in the night.

The following birds, though resident and most prominent during the winter months are omitted from this chapter as they disperse during the breeding season and are only occasionally found breeding in gardens: Kashmir Grey Tit, Himalayan Streaked Laughing Thrush, Rufous-backed Shrike, Scully's Wood Owl. The strictly aboreal Black Bulbul, a long slim bird rather larger than our cheery friend, the White-cheeked Bulbul, is mainly iron grey, its black head sports an unruly mop for crest and has bill and legs a bright coral-red; they visit these gardens for a short spell in late April and while busily gorging themselves on the variety of wild berries then ripe, draw attention to themselves by the raucous double call notes and gregarious habits. After a three weeks sojourn, they disperse to their breeding grounds up some of the Vale's side valleys.

Finally, a picture of the main species haunting gardens during the winter months can best be described by reference to the ways



The House Crow



Photos by *Author*

The Jungle Crow

of the visitors at feeding time. When the hard winter weather sets in, with snow and frost denying birds their very livelihood, I have made a habit of feeding them, not through the medium of a bird table as this supply would be cornered and gobbled up by a horde of fearless and truculent Mynahs and quick-witted Jackdaws, but by a method of breaking up the supply of bread, cake or other available scrap and throwing it in such a way as to ensure a fair distribution for all visitors. The first piece thrown from the balcony is usually retrieved by Rastus, the friendly Jackdaw, who has now nested in a hole under the rafters of my bathroom for the past three years, he regards himself as a privileged person, and the locality, his own territory. Whether there are other birds present at the time or not is immaterial, crowds will arrive in arithmetical progression in answer to Rastus' summons that food is in the 'offing': this is a peculiarly unselfish trait, shown by all birds during hard times. Rastus, now with feathers fluffed, a picture of pride, takes up his perch near at hand, bread in bill, looking the embodiment of a 'King of the Castle'.

As each piece is thrown, a mêlée ensues in which Jackdaw, House Crow and even the giant Jungle Crow jostle with the Mynah for possession. This 'rough housing' is too much for the patient flocks of Sparrows and for the pair of Bulbuls in attendance—note, only a pair of Bulbuls, a vicious trait in their character does not permit any other bird of the species to trespass in their area: however their needs are attended to and the Bulbul's provender placed at one's feet, while that for the Sparrows, so powdered down as to be a negligible quantity for the bigger birds, is strewn about the boards. Should he still be pouting with pride, bread in bill, the cute Rastus will quickly discard it and capture the first piece of cake thrown. The ubiquitous Pariah Kite with its deft talons and unerring swoop provides the nightmare of the party, even to its ingrateful dive that seizes the morsel from the hand before it is thrown, but done with such accuracy that scarcely ever are the fingers scratched. Nevertheless, the cunning members of the Crow family seldom depart empty-handed. These are the birds that haunt one's doorstep at all times.

There are still two or three species that are not so bold but can also be served: the Grey Tit dotes over the kernel of the coconut, a piece suspended from a branch in the kitchen garden will draw him and his kind to it daily; though a bold minature bully, it was surprising to find that when the small Brown-fronted Woodpecker arrived and also relished the diet, the Tits gave it pride of place. A successful experiment drew a family of the Streaked Laughing Thrush into the area prepared for them in the kitchen garden. A thick bed of dry leaves freely sprinkled with unhusked rice was strewn round a puddle of water; as was hoped, the sight of their beloved hunting ground, at a time when dry leaves were at a premium, drew them, and the further discovery of a good supply of food there, tempted them to this area throughout the winter months; by the addition of blobs of suet, smeared on stones and twigs, the site became the favourite rendezvous for most of the birds of the area.

Attempt will now be made to present intimate sketches of the individual species found breeding in this delightful spot.

The Eastern Jackdaw: *Corvus monedula soemmeringii.*

By the unintiated, this glossy black bird may be mistaken for a crow, but its white eye should provide a distinctive feature for identification, the Jackdaw being the only member of the crow family provided with a white iris; when in company with crows, the smaller size and grey to whitish neck will become prominent by comparison. Numbers of the Jackdaws of Kashmir wear a distinctive white collar, just as many, are collarless, but as both types interbreed, there can be no question that there are two subspecies of Jackdaw present.[1]

Jackdaws are resident and plentiful throughout the Vale, where they breed profusely from May till July. When the five or six young are fully fledged, an increase in numbers possibly effecting the food supply, flocks go further afield and visit the higher *margs*. Their punctual arrival in Gulmarg does not vary by more than a day or two after 7th August annually.

The amount and variety of material flown to their nesting hole is considerable; clods, grass, rags and wool are carried in in their turn, and as the nesting site is used annually, a problem arises as to where the previous rubbish goes. Normally six eggs are laid and are of a greenish-blue ground, speckled and spotted with shades of brown. There were four nests in this garden, two under the eaves of the building, the others in hollows in the boles of chenars. It is evident that these birds mate for life for, even when in flocks, couples will be noticed hunting together.

They are not quarrelsome birds as a general rule, but Rastus, my semi-tame Jackdaw, with nesting hole under the rafters over the bathroom window, is most pugnacious of a morning on his return from the communal dormitory; he will sit on a balcony perch for long spells, eyeing his property even when it is not in use as a nesting site, and rudely hustle away any prospectors out house hunting; the only reason that can be put forward for this zealousness during the off season, is that the site must be used then as a storeroom; again and again it has been noticed that all scraps in excess of immediate needs are flown in and deposited, his quick return to rejoin in the affray for further scraps lends proof for the surmise.

In and around Srinagar large numbers haunt houses, gardens and fields picking up scraps where available, or with their stout bills vigorously unearthing grubs, 'leather jackets' and suchlike, obnoxious vermin admittedly, but how invoking to the peace of mind of an ardent gardener or perhaps a keen golf secretary is the resultant trail of damage done by them to lawns and putting greens.

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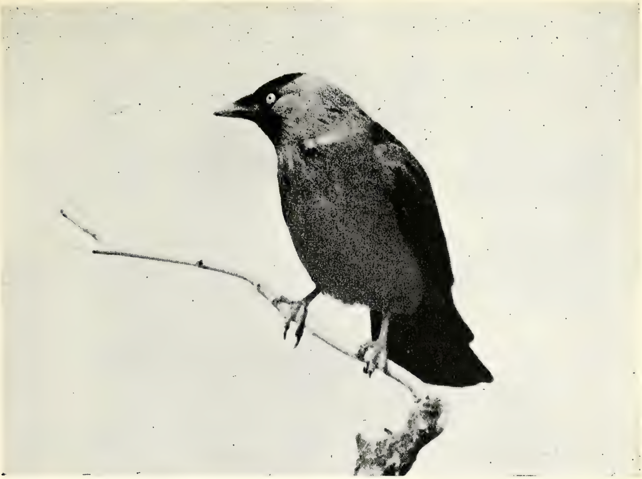
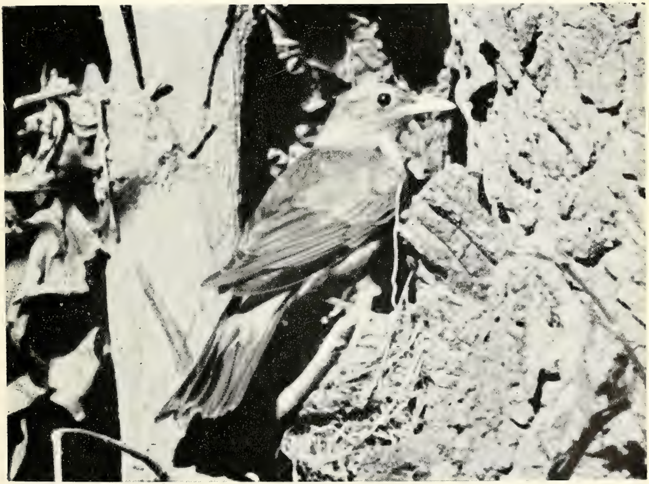
[1] The Jackdaw has a single moult in the year, in autumn. Abrasion of the silvery tips of the neck feathers by summer—more in some individuals than in others—causes them to appear blacker and almost lacking the whitish collar.—EDS.



The Jackdaw



Photos by *Author*

Tickell's Thrush

His quickness of eye and unerring judgment in flight outwits other able opponents in attendance when scraps are thrown; quick off the mark, and should by any mischance he fail to seize the scrap in midair, he will dive into the mêlée and possibly seize it from under the very bill of a slower moving species.

At dusk all birds leave their day haunts and congregate into immense flocks before flighting noisily to a communal roosting area; great distances are covered by some flights. At early light, as if by order, the return flighting starts, parties of varying strength branching from the main throng to continue to their sub-areas.

The Jackdaw strikes me as a bird full of character and one that will survive on his wits; his innocent air and disarming call *Jack*, endears him in the eyes of a bird-lover, but even granting the great help given by his tactics to bird photography, he must be dubbed an arch marauder—the 'Bogey Man' of all breeding birds. Examples of these exploits in my descriptions of the habits of Jacana and Stilt show up his black side, yet in spite of all, he will always remain a most intelligent and loveable character.

The White-cheeked Bulbul: *Molpastes leucogenys.*

India boasts a number of varieties of this cheerful family, all tame, confiding and familiar birds which become great favourites wherever met. It is considered that the White-cheeked Bulbul of Kashmir has no equal among them; its jaunty mannerisms and continual cheeriness endears it to all, its implicit trust in man soon becomes evident judging by the boldness shown in accepting tit bits offered, even to the taking of them from hand; tappings on a closed window and much chattering draw attention to the fact that entry to the feast has been denied them. Local boatmen assert that the pair of bulbuls in whose territory their 'dunga' houseboat is moored will, beyond paying the normal foraging visits at meal times, remain in the vicinity to cheer up the place should a guest be expected and further, in a psychic way, give warning of one about to pay a surprise visit.

The bird is a typical representative of the Bulbul family with a crest and tail patch and similarity of dress in both sexes. It is a resident and abundant in the Vale. The body plumage is a dull brown at a distance, but at close quarters shows the pleasing greenish tinge on the upper plumage; the white cheeks and bright sulphur-yellow tail patch add points to an otherwise sober garb, but it takes the highly developed black crest, directed forward, to complete the trim jaunty figure presented. Further research is necessary to determine whether Mr. Punch fashioned his headgear on this bird's crest. Be that as it may, the famous headgear common to both is a guarantee that all that contact them will be inspired with good cheer.

Whether it be during times of plenty, or during the arduous snows, the inseparable pair will be seen following one another, uttering their lively calls and appearing to be as happy as sand boys.

The Bulbul has no song, but their many joyful and melodious calls of three to four notes each in an endless variety of combinations, are attractive. Only a few stock phrases recur, otherwise a newly invented variation often repeated with gusto and pride, lays down a challenge to others to try and emulate so learned an utterance! Two cheery sentences commonly heard can be put into words: *Tea for two* and *Take me with you.* In entire contrast to this daylong cheeriness, a quaint sad chattering is set up towards sunset, and though the devoted Joan is in close and sympathetic attendance Darby remains inconsolable; this hysteria continues for periods of a quarter of an hour or so, during which the Bulbul flirts its wings and weeps copiously; an occasional emotional full-throated call is sandwiched between these wailings in order to attract, it is presumed, listeners from afar to these mutterings of his utter grief at sight of the fast setting sun.

Though so tame and confiding where human beings are concerned, they form fine sentinels for the avain throng and vie with the Common Mynah in giving timely warning of approaching danger.

On one occasion great excitement prevailed over the sighting of a possible pair of hybrids, with red cheeks and a reddish-yellow tail patch; fortunately, owing to a wartime exhaustion of the supply of dust shot in Srinagar, the dangerous time lag of a day or two before the hoax was discovered was bridged, and the birds saved from extinction at the hands of some keen collector· The hotel bearers had thought fit to anoint this particularly confiding pair of Bulbuls, always in atendance in the dining room, with the red stain so freely used during the 'Holi' festival.

The nest is a well-knit structure of roots, neatly lined with fibre and usually placed in a thick bush within reach of the ground, but a couple of pairs, more bold and confiding than the rest, built annually inside hotel living rooms—one, in the much frequented wireless room on a hanging gas lamp, the other in the ballroom on an electric lamp bracket continually in use. Although this familiarity was viewed with much disfavour by the hotel authorities for obvious reasons, broods as a rule were successfully reared amidst all this noise and bustle. The eggs, two or three to a clutch, are very handsome having a pinkish ground with spots and speckles in various shades of red.

In accordance with the system of size comparison used by well-known ornithologists and copied by me, the Bulbul family of 8 in. average length, forms one of the stock sizes used to aid identification.

Tickell's Thrush: *Turdus unicolor.*

Although of plain attire, this most delightful Thrush, the size of a Mynah, arrives in March and by its song and confiding ways endears itself to all. At any time of the day, especially in the early morning and at dusk, the green lawns will have their quota, showing birds gaining a yard or two at a time by a curious series of short and speedy hops before, either inanely staring into space or making a vicious thrust into the ground with the bill in search of their worm diet.

The song cannot be called monotonous as it consists of a fair compass of sweet notes well modulated, and with each burst of song ending in trills; in volume the song falls short of that of our Song Thrush at home but nevertheless it is a pleasing asset in any garden. Its plaintive yet delightful solos are at their fullest and best during the grey dawn, and it is not until these Thrush concerts have subsided, that the morning air begins to pulsate with the calls and songs of a horde of other birds. During the flighting of Jackdaws and other flocks of birds making for their chosen dormitory roosts, this Thrush has a curious habit of scolding while searching out a perch for the night; however when the light begins to fail, it pours forth a glorious evensong to herald in the night.

The nest is a deep cup composed of moss, roots and dry grasses, and is lined with fine fibres : no mud has been noticed in their make-up. The eggs, usually three in number, are greenish spotted and blotched with rufous. The nesting sites, though in the majority of cases averaging in height only about 10 ft. from the ground, are difficult to get at from a photographic standpoint as the nest is usually placed in the fork of a tree trunk and in dense shade; these sites, in spite of requiring much judicious clearing of the foreground, offer, in but the most favourable cases, a chance of getting direct sunlight to penetrate into the area and that, only for short periods during a day's work.

I have only been able to steel myself to portray these birds at the nest on two occasions. The impression gained during the first sitting was that deep shade was imperative for the welfare of the young: their gaping and panting as soon as the light was let in aroused disconcerting pangs of guilt, however the reaction to this exposure shown by the self-sacrificing mother bird—her immediate arrival at the nest, regardless of possible danger, to give shade to her callow young even to the extent of having to be hustled by the male bird on his arrival at the nest to feed the young—made the second sitting possible, thus providing me with the Dufaycolor transparencies denied me at the first sitting owing to adverse weather conditions. All ill effects vanish however when the work has been completed and the nest again placed in deep shade, with the parents, apparently undisturbed, continuing to succour their young.

The Himalayan Paradise Flycatcher: *Tchitrea paradisi leucogaster.*

While being paddled along the willow-bordered margin of Anchar Lake, a newcomer to Kashmir, a copper-coloured, Bulbul-like bird was seen, and in answer to my query, the Mussalman Kashmiri shikari named it Husseini Bulbul. While cogitating on an explanation for this reference in name to so revered a saint of the Muslim faith, another bird, mostly white with a pair of immaculate long streamers literally floated through the contrasty light and shade of the grove; it was then, when my informant pointed out that this was the male bird, that I made a mental note that its local native name had been well coined, and was not surprised on final identification to find that its name in English was Paradise

Flycatcher. It is in my estimation the most striking bird to be seen in these parts and a sight which makes even the least bird-conscious pause in wonder.

The hen is of slim bulbul-like build, and though of similar size to the male, lacks the pair of long, thin, ribbon-like tail feathers and is of a rich chestnut-coloured upper plumage in contrast to the adult male's pure white. There is never any change of colour in the female plumage.

Later the same morning, replicas of the cock bird were often seen but with the white parts and streamers chestnut-coloured as in the hen birds; it was further noted that the streamers carried by them were of varying lengths, some just sprouting beyond the bulbul tail, others up to the average size carried by the white birds; proportionate to the length of these growing streamers, white patches on the wing coverts become noticeable; a reference to the bird books later proved that these copper-coloured birds were immature male birds during the stages of gradual transition before reaching the final immaculate white plumage of the adult male. This complete change over is not effected until after the third autumnal moult.

Once fully adult, except for the crested head and neck, which appear normally as a dark blue-black but changing in colour to an iridescent indigo-blue when exposed to direct sunrays, bill and spectacles that are a cobalt blue, and wing quills traced with fine black lines, the bird is pure white. Its pair of elongated streamers attain an average length of from ten to twelve inches in excess of the normal tail feathers: many patriarchs though, carry sets exceeding this by quite six inches or more.

In company with the Golden Oriole, the Paradise Flycatcher is among the latest of the summer migrants to arrive; the latter half of April sees them in and few remain after the beginning of September.

The seemingly unbalanced flight, due to the exaggerated tail streamers, offers small resistance to the speed and accuracy of the swoops, the snap of the bill seldom fails to seize its fast-flying prey, but should it fail, the unchecked and perfectly controlled flight leaves no doubt as to the success of the second snap. Their restless fussiness and incessant sallies from the depths of the shady foliage through light and shade emphasises the pure silvery plumage of the adult male, as the bird flutters erratically through space with long waving streamers trailing behind. These manoeuvres keep them in view throughout the day.

The nest is an exquisite affair. A deeply-cupped inverted cone, built of fibres neatly woven together and ornamented on the outside with blobs of cobweb; it is very snug and comfortably lined with a silky down. The eggs, three to four in number, are very handsome reddish eggs. Semi-submerged willow groves are most favoured; here nests may be found not more than 5 ft. to 6 ft. from the surface of the water, but in gardens, the safety of a shady chenar is usually sought and nests as a rule vary in height from 20 ft. to 40 ft. from the ground.

The male bird is very intolerant of intruders and will often give away the position of a nesting site by his excited and petulent cries of *Weep poor Willie weep—poor Willie*, as he dashes at all comers in his characteristic somewhat wobbly flight. In spite of this vigilance, the contents of many nests are destroyed by shrike or crow.

It is not only a delight to watch a brooding pair, but a gift to the photographer, as both male and female share in incubation to such an extent that a change over at the nest takes place within the half hour, offering many chances of picturing both birds alongside one another. A much prized Dufaycolour slide, not only emphasises the colour contrast between cock and hen but also depicts the male's delight at his visit to the nest, sitting bolt upright tail feathers splayed out, twittering sweet nothings to his sitting mate.

In common with all birds that prefer shady sites, there is much to be done in order to let the sunlight into the arena. Fortunately for pictures of this bird, their beloved willow saplings are pliable and amenable to much bending; a rope, a heave and that willow is controlled, and so on, if necessary, *ad infinitum*; once the sun is thus harnessed the rest is comparatively easy as the subjects are not shy.

The Indian Oriole: *Oriolus oriolus kundoo.*

Ornamental associates of the fascinating Paradise Flycatcher in gardens and willow groves are the handsome and richly coloured Golden Orioles—the males in their bright golden yellow plumage except for the black wings and central tail feathers, the females, less striking, with upper plumage a yellowish green, a sullied white streaked brown beneath, and brown wings—supply an additional touch of life and brilliance to the many spacious and restful private gardens in Srinagar. These birds are of medium size, solidly built, and larger than a mynah.

As breeding migrants, Orioles visit Kashmir; large numbers reach the Vale in late April, and having completed their breeding, disappear again by the beginning of September.

Except for a harsh cawing call uttered in soliloquy, and the continuous string of peevish imprecations hurled at unwelcome intruders into their zone, these birds have an extensive repertoire of pure loud melodious notes most pleasant to hear, especially those oft-repeated triple call notes, which are both varied and attractive. Although Orioles are not the first birds to greet the dawn, yet, once started, the volume of their liquid notes—for song they have none—dominates a multi-voiced avian concert. The charm of those mellow flute-like calls must be heard to be fully appreciated.

About noon one sunny morning, while returning from a shikara trip across the Anchar Lake, and nearing some narrow willow-covered promontories jutting out into the water, a Golden Oriole festival was seen to be in full swing. These graceful willow groves backed up by Mahadev's still snow-capped ridge and reflected in detail on the still blue waters of the lake, formed the picturesque setting. At the outset, superimposed on this scene were some six excited Orioles increasing in numbers eventually to twenty birds, who not only added further colour, but provided a large amount of interest to the watcher.

The keen rivalry shown by the male birds, the frequent use of a variety of call notes, the flash of brilliant plumage in the sunlight during the chase from tree to tree with flight, now dipping, now erratic, the flirting of the wings, the spead of the tail, crammed into a nutshell the ways of the Oriole and stamped the scene as a normal deal in their Marriage Market. Attracted by the calls and excitement from this area, every Oriole within hearing, male and female, gathered round as interested spectators and encouraged the contestants with well-modulated and persuasive calls. The original party had gathered in this grove to settle the ownership of the two hen birds in the party. Judging by the guile shown by one of the hens in the party and her antics, she must have been a female of vast experience; when the contestants were on the point of exhaustion, she flew away out of the area and from her new perch uttered her harsh *caw* getting no response to this, she again entered the arena —her next flight however was successful for, in answer to her further squawk, one of the male birds followed her and with this, the drama must have ended, for the crowd of Orioles automatically dispersed in all directions.

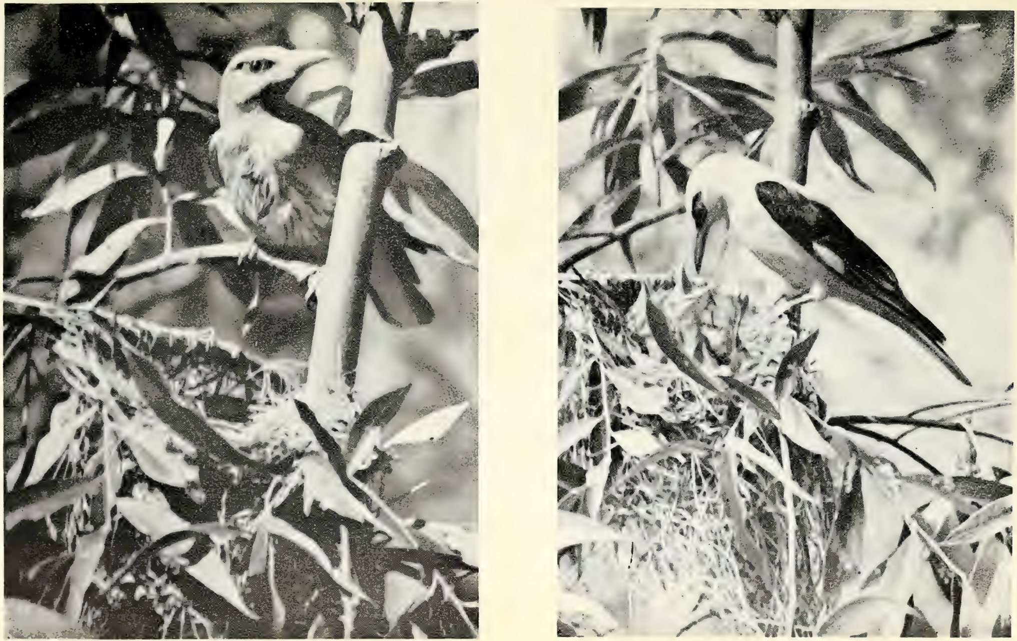
This encounter with a crowd of Golden Orioles was a great occasion: normally the birds are seen in pairs following one another from tree to tree, and are usually the only members of that species within that given area.

Though shy and more heard than seen, these Orioles will brook no interference in their nesting areas and will boldly attack with great determination all comers; the swift direct flight, attended by a string of petulant cries, carries on the furious onslaught until the intruder is driven out of the area.

In the Plains there appears to be a pact between the Oriole and that other firebrand, the King Crow; the fury of their assaults on trespassing crows, falcons and kites are spectacular and worth watching. It has been noticed that the friendly cheery Bulbul is permitted to intrude in this zealously guarded area, even to the extent of nesting in the same tree as either of these 'thrusters', thereby enjoying immunity from the attack of their many enemies.

The nest is a grass hammock slung in a slender fork near the extremity of an overhanging branch, usually very difficult to reach from ground level: it looks a bulky affair with fibres and other oddments dangling down in haphazard fashion, but a closer view will show that the basic binding material—narrow strips of strong coarse grass—supplying the support to carry the nest, is firmly bound round the prongs of the chosen fork and the deep neatly-woven cup, forming the egg-chamber, is strongly bound to the base. The eggs, three or four to a clutch, are a bright shining white with black or reddish brown spots thinly distributed over the whole surface of the egg.

In Kashmir these birds used to breed freely in the semi-submerged willow groves bordering Anchar Lake; their taste there



Photos by *Author*

Female at nest

Male feeding chicks

The Indian Oriole

for suspending their nests low, often only 6 ft. over the surface of the shallow water, presented a gift to the photographer. Times have changed. Owing to the influx of those innately-keen and insatiable naturalists—British schoolboys—the birds have taken to the safety afforded by mighty chenars and now build out of reach of both, the budding ornithologist and the harmless photographer. There has always been great difficulty in obtaining a good set of pictures of the Orioles at the nest owing to their breeding season synchronizing with boisterous monsoon weather when high winds are answerable for many failures, as, during the split second delay between button press and shutter release, the slender twig on which the nest is slung is often blown out of the prefocussed area.

The Himalayan Starling: *Sturnus vulgaris humii.*

The iridescent sheen on head, neck and mantle of green, purple or coppery-red which sparkles in sunlight when the bird is near at hand, disappears in the distance, giving to the Starling the appearance of a glossy black bird, more particularly so as by the time of arrival in Kashmir the buff edgings to the feathers have been worn away. Though of similar size, the bird is of stouter build than the Bulbul.

The Starling is among the first migrants to arrive in Kashmir, appearing with unfailing punctuality close on the heels of the Swallow; over a period of three years, the first arrivals have been noticed on the 27th February. Soon after this date flock upon flock invade the land, many remaining to breed, while others pass on to breeding grounds in Central Asia and even Siberia. A stream of flocks, each numbering from twenty to thirty birds, use this route again during September when on their return flight to winter quarters in India. During the intervening months, the period of the breeding season, though birds may be seen in company on favoured lawns, it is obvious that now all team work is dormant, individuals being occupied mainly on family chores.

The effects of ruthless persecution in their winter haunts in India, possibly well merited by the great damage done by flocks to crops and fruit, and also, though perhaps not so well merited, for their tastiness in starling pie, has produced a species of markedly nervous disposition. 'There's not to reason why'—a whole flock busily foraging on the lawn one moment will rise in unison in answer to a squawk from a single member and manoeuvre with great precision until reaching the topmost branches of some tree; from this vantage point, after a spell of preening of feathers, the birds will glide down to the ground, following the leader in ones and twos to continue their foraging. This solidly-built glossy black bird, made to appear top-heavy by its stout yellow bill, never hops but its quick deliberate step gives to a flock an air of hustle.

The Starling's pride in the delivery of its song knows no bounds; with bill raised to the skies and wings shivering, it utters its lengthy and varied song with such gusto and persistence, that surely it must be an untutored human ear with limited compass that fails to catch the subtle intonations it must contain, registering as it does but a jarring unpleasant jumble of discordant sound.

The birds tend to colonise when breeding, their loosly-knit and untidy nests are of grass lined with feathers and placed in holes, those in willows being mostly favoured; other suitable sites are found under rafters in buildings or even holes in banks. The six eggs are of a very pale blue. It is strange and therefore noted here that, in these breeding territories, single eggs freshly laid, are often found lying deserted on the ground within a few feet of known occupied nesting holes.

The Common Mynah: *Acridotheres tristis.*

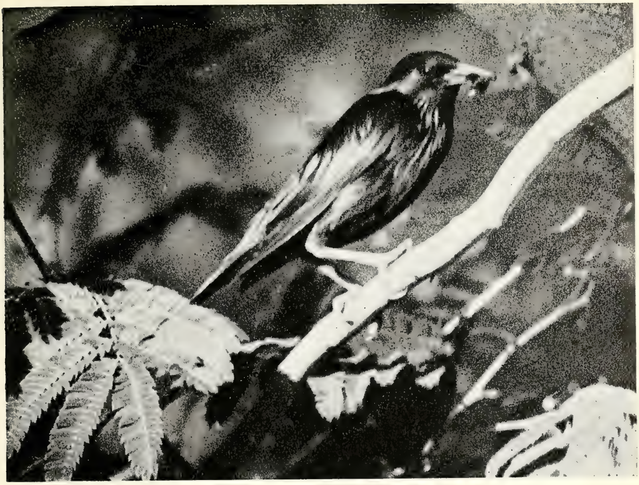
Anywhere in India from the moment the ship anchors at a port of disembarkation until your wanderings take you over 8,000 ft. above sea level, this vinous brown bird, with bright yellow bill, legs and eye patch, and if in flight, the prominent white streak in each wing, will be met. It is one of the commonest birds in Kashmir where it is resident. Its length of 10 in. is also used as a stock size in the system of comparative measurement.

From very first introduction it becomes obvious that the bird is a character, inordinately conceited and a clever opportunist, he is always in company with and ably backed up by his devoted mate; his bullying propensities may not be evident at first, but will not escape attention. The species is very sociable, and except during the breeding season, will be met in flocks of varying strength, yet always hunting in couples within the flock; further, this species, in common with other residents that are not spurred on by the Spring and Autumn urges to cover immense distances in migration, collect daily at dusk in large parties and fly off to distant roosting areas, here pandemonium reigns till dark, with even minor outbreaks throughout the night.

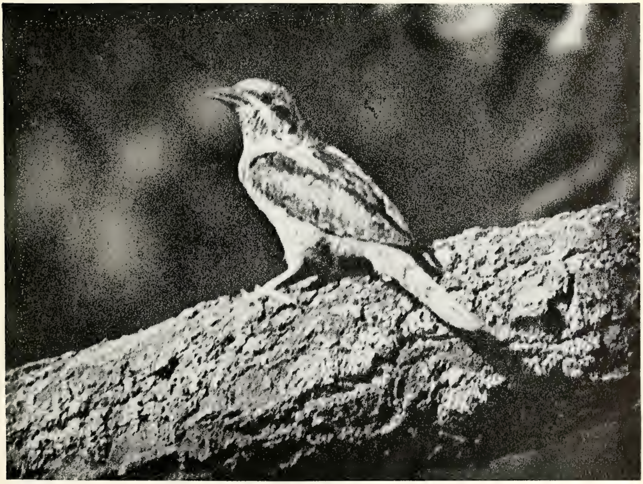
Their solid frame upright bearing and jaunty purposeful walk entitles them seemingly to an undisputed right of way; they will sum up a passer-by as harmless and make way for him at the last moment and return immediately to the spot to carry on the good work, but at other times, some instinct will prompt when, with a querulous cry, the Mynah will take to wing and fly away well out of reach. As a family, their familiarity and boldness give them the main pickings when ploughing or weeding is in progress, individuals will seize an unearthed grub hardly before the digging implement has been withdrawn from the soil; other species, though present at the time, are less trusting and thus forego many a luscious morsel.

All other species place implicit trust in the Mynah's undisputed watchfulness, its alarm is sufficient to make all scatter to instant safety; occasional false alarms are given by irresponsible individuals but these only with a view to dispersing the assembled throng in order to pick up at leisure the deserted tit-bits.

Their chatter drawn from an immense vocabulary is endless; and though not attractive to the human ear, the confidence in delivery, the puffed out feathers, and the assertive bobbing of the



The Himalayan Starling



Photos by Author

The Wryneck

head mark them as being words of much importance if judged by the appreciation shown to each utterance by his doting mate.

A very common sight during the breeding season is a desperate fight between two cock birds, whether it be caused by the fervent attentions of one of the contestants to a maid already affianced or to careless tittle-tattle is immaterial, but the resultant tussle is remarkable for its ferocity; soon one bird lies prone, pinioned down by the conqueror now standing over him, who, beyond uttering a volume of abuse, appears to have finished the fight, but this is not the end, for, now comes the turn of the quickly assembled spectators to join in and with scoldings and unmerciful pecking all but kill the helpless vanquished one.

As long as a cavity is found large enough to accommodate the bird, the site of the nest is immaterial; holes in buildings, trees or banks are alike; without showing any fear even a conveniently sized space in the foundations of an occupied vulture or kite's nest will be used. There appears to be no question of rights of occupation in Mynah law, the cavity of their choice will be occupied and due to their boldness and untiring persistence they invariably succeed in evicting the rightful owners; even birds of larger size have been known to give up the unequal contest and allow the Mynahs right of way.

Nothing comes amiss for nesting materials, a miscellany of rags, paper, grass, cotton wool form the debris that gets flown in to make up the bulky, untidy nest. The five to six glossy sky-blue eggs are beautiful.

The Kashmir House Sparrow: *Passer domesticus bactrianus.*

Although a resident, the House Sparrow is not as numerous in the Vale as the species is throughout the length and breadth of the plains. Further it is interesting to note that although every village, even those over 'hill station' height, hold a quota of these birds, yet the species is not represented in Gulmarg (9,000 ft.) where the Cinnamon Sparrow holds sway.

It is not deemed necessary to describe the dress of these ubiquitous vagabonds, they own very nearly the whole world, however, their size of 6 in. in length is used as a stock size for comparative measurements.

Wherever met, the Sparrow is the same bustling bird, fussy and ill-mannared, knowing no rebuff even though haunting human habitations, usually in large numbers. His nuisance value is much curtailed in Kashmir as the fair number that remain throughout the winter become subdued and well-behaved citizens, arousing much human sympathy; the hard winter robs them of their sprightly ways and makes them appear unobtrusive and grateful to man for the smallest crumbs scattered for their use; even the noisy chirrupings are so subdued as to become negligible.

At the end of February it becomes evident that the local sparrow world is beginning to take notice of the approach of spring, and in consequence the well-behaved winter cock sparrow appears again in his true colours. It is now that fighting becomes general and his endless monotonous chirrupings, offensive; his day-long noisy struttings with drooping wings and cocked tail merits even the displeasure of bored hens, as evidenced by the amount of feathers plucked by them from these prancing, conceited beaux; there are, however, temporary lulls in these displays, but these are used with relish in order to have a spirited scrap with a supposed rival, resultant scars are no deterrent, and thus these noisy displays have to be endured until the cares of family life and the needs of a large family quell this riotous conduct.

There is a defined breeding season in Kashmir—May to August—hence residents here are spared the continuous noisy courtship days, the lot of our neighbour in the Plains of India, where breeding goes on nearly all the year.

These birds employ the same tactics as their associates the Mynahs and will boldly evict birds in occupation of nesting sites appealing to their fancy. The nest is a bulky affair of straw and feathers loosely put together and placed in a hole under caves or in thatch, but in Kashmir it is common to find bulky dome-shaped nests built high up in poplars. Sparrows are untidy builders and litter the environment of these sites with much debris. The clutch numbers five to six eggs which are very variable in colour, but have a general tone of grey or brown, covered with speckles and blotches.

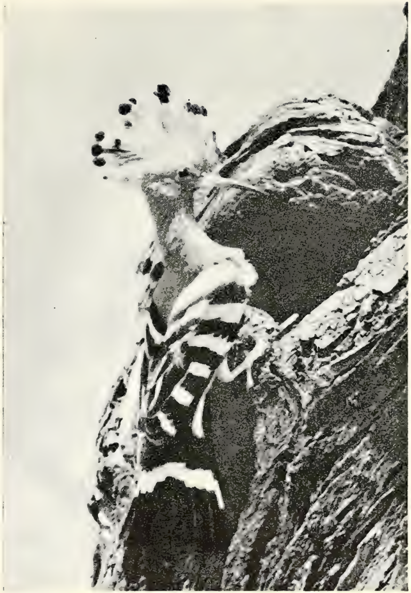
The Brown-fronted Woodpecker: *Dryobates brunnifrons.*

This Woodpecker about 8 in. in length is distinguished from the other pied bird in Kashmir by its smaller size, duller plumage and head: the umber-brown forehead and crown with a crest which, in the cock bird is a bright golden yellow in front and crimson behind, while in the hen a dull yellow, supplies the most obvious aid to identification.

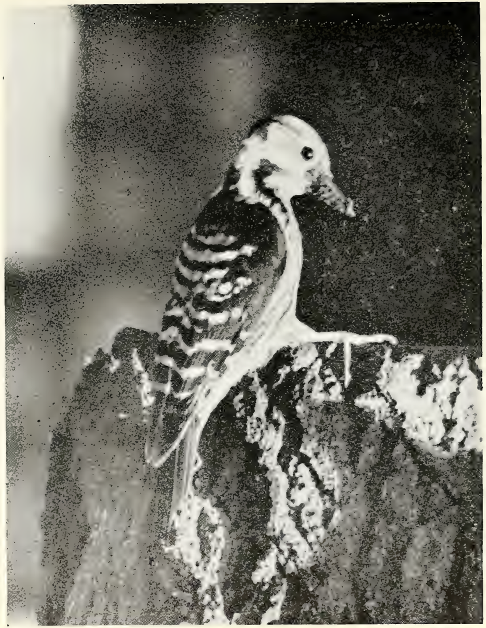
The birds are resident in the Vale and the smallest of the three representatives of the family in these parts. As far as is known they do not haunt the surrounding mountains, judging by their total absence from Gulmarg.

Being fairly common and showing a preference for open country, they will often be seen along the narrow tree-bolstered embankments and scaling up trees in the villages, busily working a way up trunks in a series of jerks, or at rest, with claws and stiff tail balancing the backward tilted body in such a way as to give the specialised strong chisel-shaped bill full play either, to shear off bark while foraging for larvae or, in the breeding season, to drill through the hard wood and provide a nesting chamber, or yet, if disturbed, the bird may be seen in flight from one tree to another moving in characteristic heavy undulating woodpecker fashion.

The woodpecker is not shy and will allow close observation. Many a time a camera has been set up within twelve feet of a bird busy excavating its nesting hole; though so confiding, it remains on the alert, and at short intervals will draw its head out of the deepening cavity to survey the surroundings with a swaying of the body and a twisting of the head from side to side; if satisfied,



The Indian Hoopoe



The Brown-fronted Pied Woodpecker

Photos by *Author*

digging will continue, but if uncertain, the bird will freeze and sidle round the bole to thus escape the 'evil eye'.

For a shorter or longer period during the breeding season—May to July—the bird turns into an indefatigable digger and its tappings are heard everywhere, but drummings, never. This choice, trial and early desertion of incomplete borings becomes a menace to the photographer who, so as not to disturb the bird at its newly chosen site, takes no immediate action only to find at his next visit, perhaps a day or two later, that the site has been deserted, but by following up the sound of further tapping elsewhere in the area the next chosen site will be discovered.

It is not human interference that causes these desertions, as proved by altered tactics. When this predeliction for constantly shifting about became obvious, the apparatus was set up forthwith and a successful series taken without detriment to the boring: on this occasion the nesting tunnel was completed and the brood successfully reared.

Two possible reasons may be given for such waste of effort: either the bird, on reaching the average depth of the horizontal boring finds that the anticipated natural cavity or area of unsound wood, is not forthcoming, or that it is driven away by the constant interruptions caused by numbers of other brids trespassing at the site in search for a possibly suitable nesting cavity for their own use.

Tits, Sparrows and a Wryneck were seen once contesting one such boring, and it appeared as though the Wryneck had won, but in this case, although the expulsion was not witnessed, it was surprising to find that the Woodpecker, contrary to custom, had returned to take possession.

During one winter, this bird, having discovered a coconut shell hung from a willow to attract Tits, showed great relish not only for this diet but also for the suet pressed into crevices in the bole of a tree. Having had its fill, it *peek-peeked* to its mate. The punctuality of its further daily visits was remarkable, for, although heard in the neighbourhood earlier, it was never before 1.30 p.m. that the hanging coconut shell was attacked.

The Wryneck: *Iynx torquilla japonica.*

The Wryneck is a grey-brown bird the size of a Bulbul. The scaly appearance of the grey underparts neatly vermiculated with a pattern of fine black lines, the rich brown wings streaked and mottled in black and buff, the broad dark brown line from nape to back, together with a couple more down each side of the face, are so subtly blended as to make the whole outfit into an excellent example of obliterative colouration. Being akin to Woodpeckers and insectivorous, it mainly haunts the trunks of trees when foraging and then becomes very difficult to trace. Though mainly aboreal, the bird will often come to ground in search of its prey, and even here, the camouflage will hold good.

It seems strange that this remarkable gift of nature should be cast aside by the bird's arresting call notes which are soft but penetrating and unmistakable; the call consists of eight repetitions of the sound *Chetch* uttered in rapid succession without variation in scale or tone. Though these birds are not numerous in the Vale, a tally can be kept of their numbers and location throughout the breeding season by this freely uttered call.

The Wryneck arrives in Kashmir early in March and for the first fortnight appears to remain solitary, then, it is inferred, traced by the insistent calling, a mate joins up and for the rest of the season the pair are inseparable, kept in close touch by this intermittent *Chetch chetch*-ing.

The bird is tame and confiding and will allow a close approach at all times, especially when foraging on the ground or crawling up tree trunks. No cogent reason can be offered for the feeling of revulsion at this 'close up' of the bird, yet it is ever present in my case; perhaps the mottled upper plumage, its sluggish ways, the rapid movements of its worm-like tongue and finally, the contortions of its head and neck, meriting its apt name—Wryneck—calls to mind the reactions set up when in the presence of that obnoxious creature—the snake.

In May its unmistakable call again guides one along the route taken by these birds while in deligent search for a nesting hole. The most favoured site is a disused and deserted Brown-fronted Woodpecker's boring with its aperture too small to accommodate Mynah or Starling thus cutting down 'rough housing' to a minimum, a state of affairs pleasing to the peaceful Wryneck.

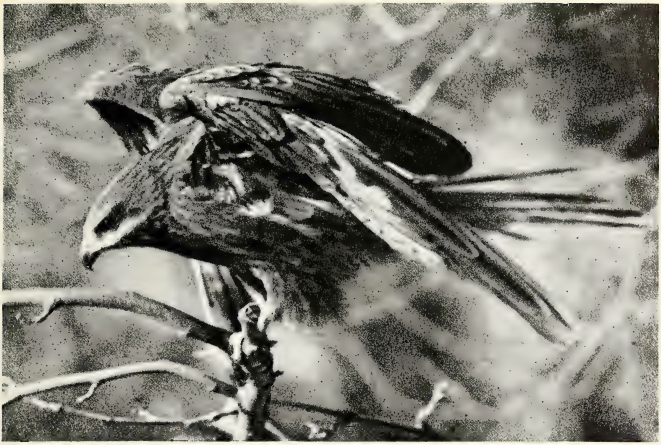
An amusing half hour was spent following up one of these house-hunting expeditions; how undaunted was the male bird in spite of his fruitless efforts at pointing out possible nesting sites to a most exacting hen! his good natured sallies again and again, made him appear a model of patience and correct behaviour. After much ado the site was finally chosen—a disused Woodpecker boring some twenty feet from the ground—here the hen bird was kept busy brooding her clutch of six white eggs laid on the bare boards or perhaps on the debris left there by the previous owner. During this period the male bird remained in close attendance, crooning a soft version of the same old tune.

From a photographic standpoint this particular nesting site was most convenient, a very little clearance being necessary to let in the light and thus enable short exposures to be given; with both birds entirely disregarding the camouflaged camera and paying innumerable visits to their young, twenty-four exposures were made within the hour.

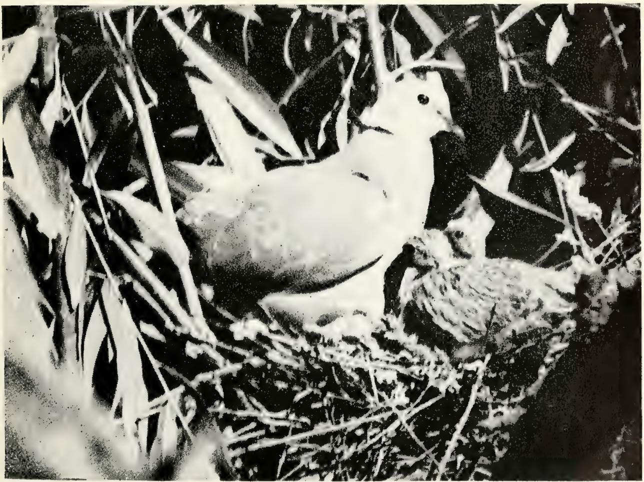
One pair of Wryneck breed annually up in Gulmarg (9,000 ft.).

The Indian Hoopoe : *Upupa epops.*

The Hoopoe is of slighter build but of the size of the Common Mynah, the long slender bill though makes it in fact longer. The boldly banded black and white wings and tail, the long bill balancing the crest, when depressed, and the fawn-coloured body plumage leave no doubt as to the bird's identity; the expessive crest, normally closed, gives the impression that the bird is armed with a pickaxe head, as it continuously digs in the soil, but momentarily,



The Black-eared Kite



Photos by *Author*

The Indian Ring Dove

on alighting, and at other times when agitated, the glory of the erected fawn-coloured, black-bordered crest becomes conspicuous and ornamental.

This striking yet tame bird vies with the Shrike in being the most numerous summer visitor to the Vale. It is amongst the earliest of arrivals and does not waste time before searching out a nesting site. The countryside rings with the triple-noted call *Up-poop-poop* and when that spring feeling is at its height and the display flights in full swing, a fourth note is often added. These calls are uttered from a perch on tree or building where the bird sits with neck feathers puffed out, dipping its head to each syllable. A harsh squawk of annoyance is also prevalent at the beginning of the season uttered by the male bird, either to show his displeasure at the presence of other admirers on the scene, or in his efforts to drive an obstinate spouse, still attempting to hang on to her freedom, into the nest. Although not plastered in as is the case with Hornbills, the hen Hoopoe having commenced to brood, goes into 'purdah' and is seldom seen to leave the nest until the young are hatched but is regularly fed there by the diligent and indefatigable male bird. If disturbed at the nest, the female's hiss gives a very realistic imitation of that of a snake.

Being entirely a ground feeder, one of the commonest sights on any open grassy patch is that of the Hoopoe family briskly walking or running, while methodically quartering the ground, probing here and there with the slender bill until a worm or a harmful 'leather jacket' is unearthed; this capture will either be swallowed whole with an upward tilt of the head, or the bird will take to wing and with butterfly-like flight, hesitant and undecided, fly off in order to deliver the morsel to his brooding hen at the nest.

So intent is the Hoopoe on his digging operations that he becomes oblivious to the lessons taught by past experience which should have shown that the boon companions, in close attendance, were but awaiting an opportune moment to snatch away his hard-earned booty. Knowing his even temperament, even the vagabond sparrow will again and again relieve him of his pride; the only reactions shown to this thieving are a look of blank surprise, a momentary fanning out of the crest, a short pause and then further diligent probing of the lawn.

Any dark nook or cranny will serve as a nesting site, it may be at ground level in the roots of a tree, or in a cavity in its bole, a hole in a wall or one under the rafters of a building, or yet, even on the ground inside a deserted hut. A jumble of oddments carelessly strewn serves as the nest in which generally six eggs may be found. The eggs are greenish-blue or olive-brown but soon become badly discoloured and the nest, a malodorous sty.

Later, when the family parties are out on the lawns, it is a common and pretty sight to see parties of five or six young birds in close attendance on their parents awaiting their turn to be fed; the thought that such striking birds have been reared under such evil-smelling and verminous conditions beats conception.

The Indian Ring Dove : *Streptopelia decaocto.*

Late in April the *How-do-do* of the Ring Dove is heard, and should the call be followed up, a pigeon-like bird, pale french grey with a half ring of black bordered white round the hind neck, will fly out with a clatter of wings and make its way with strong swift flight to some other distant tree; single birds have a habit of rising steeply from a perch and spiraling down to another, where presumably the intended is sitting, here with distended throat to prance about with bobbing head and thus serenade this, more often than not, unresponsive female.

A very pugnacious trend in the dove's character becomes evident soon after its arrival in Srinagar and much spirited fighting seen, seemingly to contest the right of ownership of disputed territory or the hand of fair maid. No quarter is given. The contestants sidle up and lashing out with the near wing belabour one another, uttering nervous but petulent sighs of *Ean Ean*, any advantage gained in the fight is followed up from tree to tree and the victor not satisfied until the trespasser is driven out of the area. After being witness to many such contests, how can these examples of a true fighting spirit be reconciled with that time-honoured merit bestowed on the dove as the heraldic 'Emblem of peace'!

The nest is typical, a sketchy platform of sticks with a slight depression for the two white eggs. It is placed on just as insecure a base in tree or more normally in bush or jumble of creeper, but a few feet from the ground.

The bird is numerous in Srinagar and remains latest of the migrants, some staying till the end of October; this species does not ascend as high as Gulmarg, its place there being taken by the Rufous Turtle Dove.

FISH SURVEY OF HYDERABAD STATE.

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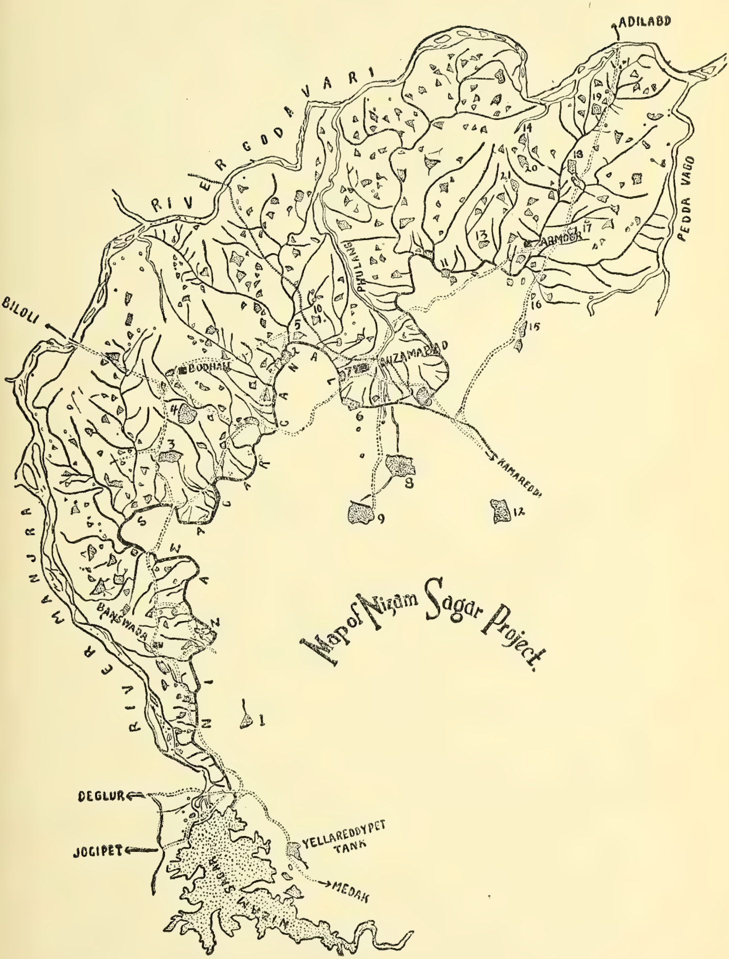
Part IV—Fishes of the Nizamabad District.

With a map and two plates

Nizamabad District is bounded on the north by Nander and Adilabad; on the east by Karimnagar; on the south by Medak; and on the west by Nander. Its area including *jagirs* is 2,365 sq. miles.

A few minor ranges of hills are found in the east and west. The largest river in the district is the Godavari, which forms its northern boundary, separating it from Nander and Adilabad. The Mānjra, the chief tributary of the Godavari, flows along the western border, separating it from Nander on the west. Smaller streams are the Phulang, traversing the Nizamabad and Armoor *taluqs* and


Map of Nizam Sagar Project.
ADILABD
RIVER GODAVARI
PEDDA VAGO
BILOLI
BODHAN
NIZAMABAD
ARMOOR
PHULANG
CANAL
SAGAR
NIZAM
KAMAREDDI
RIVER MANJRA
BANSWADA
DEGLUR
JOGIPET
YELLAREDDYPET TANK
MEDAK
NIZAM SAGAR
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FISH SURVEY OF HYDERABAD.

Pedda Vagu, a perennial stream traversing the Kamareddi and Armoor *taluqs.*

The rocks are related to the Archaean and Deccan trap formations, the former occupying a very large area. The soils are mostly sandy and rice is extensively raised by canal irrigation. The total population of Nizamabad District is 6,46,043 and that of fishermen is about 18,000. The number of fairly large tanks is 1,444 besides a large number of ponds under the canal. Average rainfall is 36.4 inches. Temperature varies between 73°F and 102°F.

The district consists of Nizamabad, Armoor, Bodhan, Kamareddi and Banswada *taluqs* and as a whole is a very small district of Hyderabad State, but so far as Agriculture and Fisheries are concerned it is the most important one owing to the vast irrigation facilities and the large number of tanks and reservoirs.

(*a*) *Rivers*

1. The Godavari is the main river, entering the district near Kundkurti in the Bodhan *taluq* and after traversing nearly 80 miles leaves it near Vabhalpur to continue its course further between Adilabad and Karimnagar districts, forming the north-eastern boundary of Warangal and Khammam districts and finally entering the Madras Presidency. It is a perennial river, the volume of water during the rainy season is tremendous, but during summer, deep pools are formed connected by a slow-moving stream of water. These pools are exploited by fishermen and a large number of fish is caught, but owing to lack of transport, the fishes are sun-dried and consumed locally. If transport facilities and better means of catching were available a considerable quantity of fish could be sent from various places on the river to the markets.

2. The Mānjra feeds the Nizamsagar reservoir and starts its course below it in the form of two streams, these two streams join a mile down the dam and flow down about 55 miles to fall into the Godavari near Kundurti 6 miles from Basar. It forms the western boundary of the district, separating it from Nander District.

3. The Phulang is a tributary of the Godavari, starts from Kolaspur tank and after a course of about 30 miles joins the Godavari river near Kondur. It is a perennial stream, but the volume of water during summer is very little. During its course it feeds many irrigation tanks.

4. The Pedda Vagu or big stream is formed by the combination of three small streams. It passes through the Kamareddi and Armoor *taluqs* and joins the Godavari, after flowing in the north direction for about 50 miles, near Tadpakal.

(*b*) *Reservoirs and large tanks*

BANSWADA TALUQ

1. *Nizamsagar* is about 100 miles to the north-east of Hyderabad city and about 54 miles from Nizamabad town. It is the largest reservoir in the State and is formed by damming the Mānjra. Its catchment area is 8,376 sq. miles; the length of the dam is 12,800 ft. and waterspread area 48·66 sq. miles when full. It is provided

with 12 automatic flood gates on the east and 16 on the west side, some scouring sluices have also been provided near the east flood gates. The depth of water above average bed of the river is 102.5 ft. An overflow has been provided towards the south-west and many days during the floods no traffic is possible on the road over the overflow. The reservoir extends to Yellareddi *taluq* of the Medak District and provides many angling spots on that side. The east and west streams join up about a mile below the dam. During summer and winter when there is no flood, deep pools are left which are connected by a slow-moving stream. Fishes of very big size are caught in these pools and these are really the angler's paradise. One of these pools is situated very near to the Guest House where 'mahseer' is found in large numbers. The survey of the streams yielded several species of fish, especially young ones of *Barbus* (*Tor*) *khudree* Sykes, the 'yellow mahseer', locally known as 'Irraham' ranging from 4-8 inches in length, it shows that these fishes breed below the reservoir as they can not go up the stream owing to the dam.

During our survey large numbers of young Eels, *Anguilla bengalensis* Gray & Hardw., were caught, ranging from 6 to 8 inches. It is not certain whether the eel breeds in freshwater or the elvers come upstream during floods. Investigations are in progress and the results will be reported when some more data is available. When the flood-gates are opened during the rainy season and then closed, large numbers of large-sized carps get stranded in shallow pools and amongst the boulders, they are clubbed to death by the villagers, some are sold and the rest sun-dried as salt is not available to them in large quantities. It is essential that legislation should be introduced soon to stop the massacre of the ripe breeders which come upstream during the floods. It is estimated that no less than 200 tons of fish is caught below the flood-gates during the rainy season. If means of quick transport were available, large quantities could easily be brought to the markets.

There are stretches of land down the dam which can easily be utilised for the establishment of fish-farms and at least one Biological Station may also be established for studying the migratory, breeding and other habits of fishes.

The canal takes its origin from a place which is about 1½ miles to the east of the dam. The reservoir is easily accessible to visitors. N.S.Ry. Bus Service reaches there from Hyderabad city and a regular bus service is available from Kamareddi railway station, which is 33 miles from Nizamsagar. Five rest-houses are situated near the dam and all facilities are available there. A beautiful swimming pool has also been constructed for people who go there for sightseeing.

Many islands are seen within the reservoir and most of the bed is full of boulders; submerged trees are also present which are a great handicap in netting. In future it would be advisable that when constructing a dam, the bed should be cleared of all trees and shrubs so that netting may be easy.

2. *Singtom reservoir* has a waterspread area of about 1½ sq. miles when full, it is an irrigation tank, situated amidst forest and

surrounded by small hills; it is formed by damming a small tributory of the river Mānjra. Its distance from Nizamsagar is about 8 miles to the east on the Banswada road. Being in a hilly tract, its bottom is full of boulders and when the water level is low stumps of trees are also visible jutting out and are a great handicap in the netting of deeper waters. The dam in part is strengthened by a masonry *bund* and is provided with two overflows on the two flanks; it is about ½ mile long. A smaller canal takes its origin from the tank, irrigating a large area.

Many small tanks are situated near the canal in which 'murrel' is the chief fish, besides carps, the young ones of which come along with the canal water. Depth varies from 30 to 45 ft.

BODHAN TALUQ

3. *Ali Sagar,* named after the famous engineer, Nawab Ali Nawaz Jung, who is responsible for the designing and construction of Nizamsagar and other important reservoirs in the Dominions, is situated 9 miles south-west of Nizamabad town. It is a long tank surrounded by hills; the surrounding scenery is very picturesque. The Nizamsagar canal enters it at its 55th mile and after filling it makes its exit from the other end where regulators have been provided. It is full of dead trees and shrubs and even shallow margins are difficult to net. If cleared, it may provide a large quantity of fish every year, but as at present, only hook and line can be effective for catching 'murrel'; plying a net is very difficult. The water spread area is nearly 2 sq. miles and the greatest depth 40 ft.

The natural surroundings and a commanding view of miles around from the Inspection Bungalow, constructed on a small hillock, attracts thousands of visitors every year.

Wallagonia and 'murrel' of quite a big size are caught on hook and line and it can be of good use if the submerged trees and shrubs be cleared out. The land below the reservoir is excellent for the establishment of fish-farms owing to the fact that water can be let into the ponds easily from the distributaries and the natural slope is very convenient for draining purposes.

4. *Rudrur tank* is about 13 ft. deep and has waterspread area of about a mile. It is situated by the side of Nizamabad-Nizamsagar Road, about 6 miles from Bodhan town. The shallow margins are practically full of 'elephant grass' (*Typha* sp.) and the bottom is free from boulders, and hence it is a very good tank for collecting fish. 'Murrels' are found in abundance. It is a perennial tank and does not dry up during summer as it receives seepage water from the canal and also from the paddy fields lying higher up.

5. *Bellal tank* is situated towards the south of Bodhan town at a distance of 3 miles. It is a fairly big tank, having waterspread area of about 1½ sq. miles and a depth of 15 ft. Vegetation is not so profuse as in the Rudrur tank; only the margins are grown over with sparse vegetation. *Labeos* and 'murrels' are the principal food fishes found in it.

6. *Jankampet tank.*—The Nizamabad-Bodhan Road after the 5th milestone passes over the bund of this tank. It is a perennial tank, receiving seepage water of the canal. Its waterspread is not less than one sq. mile and has maximum depth of 20 ft. It is remarkable that very little 'elephant grass' is present in this tank. It is our surmise that its margins have an abrupt fall and very few shallow spots. Carps and 'murrel' are found in good quantities and we think that it is ideal for carp culture.

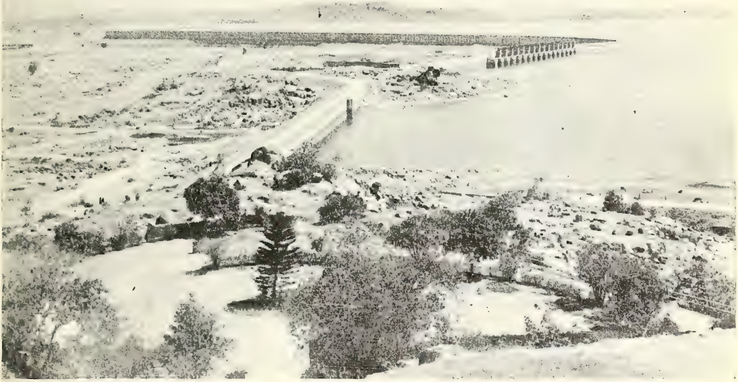
NIZAMABAD TALUQ

7. *Másani tank* is about 3 miles from Nizamabad town. Its waterspread area is about 1¾ sq. miles. The dam is not a masonry one and of the usual type as is common throughout the Dominions, built for the conservation of water for irrigation purposes. Its height is 18 ft. and length about a mile. The Nizamsagar Canal drains into it at its 64th mile and upto this reservoir is the perennial zone of the canal. Regulators are provided at the other end from where the canal has its exit. The shallow margins are overgrown with 'elephant grass' (*Typha* sp.) but the deeper parts are clear. Being fed by the canal, the tank is perennial and contains, besides other species *Labeos,* Murrels and *Wallagonia* of fairly big size. Murrels of 3 ft. and over are not uncommon amongst the catches. It is very suitable for carp culture.

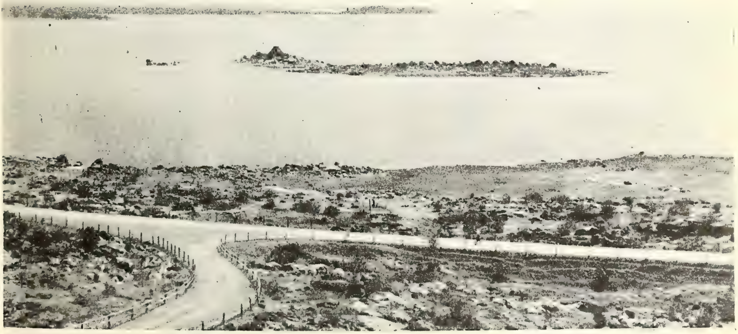
8. *Raghunath tank.*—It is located about a mile from Nizamabad town, just below the old fort and is also known as 'Fort tank'. The waterspread area is about 1½ sq. miles and the maximum depth about 25 ft. The bund is of mud. The Nizamsagar canal, although passing very near to it, has no direct connection with it. It is a perennial tank and used to supply drinking water to the town but is now used mainly for irrigation purposes. Vegetation is profuse. The average depth of water is 10-15 ft. and amongst the catches murrels of fairly big size are very common. Hooks and line is the most common method of catching fish and people shoot murrel when the water level goes down during summer.

9. *Kolaspur tank* derives its name from the village situated about 8 miles from Nizamabad town on Nizamabad-Manchippa Road. The waterspread is about 1½ sq. miles and depth approximately 20 ft. when full, consequently during summer very little water remains in the tank. Its water is used for irrigation and a small channel about 4 miles in length arises from its right flank. Its catchment area consists mainly of Manchippa forest and it receives water during rains from the overflow of Manchippa reservoir. The bottom is mostly even, free from boulders and very suitable for exploitation by means of drag nets as there is not much of vegetation. It is an ideal tank for carp culture.

10. *Manchippa reservoir* is the main source of water supply to Nizamabad town, being situated at a distance of 14 miles from Nizamabad. It is surrounded by hills, overgrown with beautiful deciduous forest and has a very attractive scenery. It is a sort of depression where water collects from the surrounding hills. Its waterspread is about 2 sq. miles but its volume of water is considerable as it is about 50 ft. deep. The bund is 1/3 mile long



Nizamsagar—General view, showing the dam.



Nizamsagar—General view, in which some islands are visible.

Nizamsagar—West channel. Guest House is on the extreme left of the picture.

River Godavari during rainy season.

and built up of mud. Vegetation is sparse as compared to other tanks of the district. Murrels of fairly big size are commonly caught and brought to the Nizamabad market. Although it is situated within the hills, the bottom does not contain many boulders and is mostly even. From the ecological viewpoint it is one of the finest spots in the Dominions and within easy reach to students of Zoology and Botany. A beautiful Inspection Bungalow is situated very near to the reservoir.

11. *Gandáram tank* is adjoining Jankampet Railway Station. Its bund is a small one and of the usual mud embankment barely a furlong long, the tank attains waterspread area of more than 1½ miles. It is a shallow tank, mostly full of boulders, and whatever portion remains under water is full of 'elephant grass' (*Typha* sp.) which is locally known as 'Tunga'. It belongs to a *Jagir* of the same name. Murrel is the most predominant fish.

12. *Gutpa tank.*—On the 90th mile of its length the Nizamsagar canal enters this small tank which has a waterspread area of only about ¾ sq. mile; the height of the bund is 20 ft. It is 11 miles from Nizamabad town and 3 miles to the interior from the 8th milestone of Nizamabad-Armoor Road. Regulators are provided on the left flank of the tank from where the canal makes its exit. The surplus water from another tank enters this tank which remains more or less full owing to the canal, hence the water is seen usually overflowing from its two flanks. This tank is famous for its murrel which is caught and brought to the market daily.

13. *Indalvai tank* is situated about 2 miles away from Indalvai Railway Station. The bund is about 40 ft. high and with waterspread area of 1⅛ mile. It is an irrigation tank and very little water is left during summer. Some boulders are visible scattered here and there.

KAMAREDDI TALUQ

14. *Kamareddi tank* is a fairly large irrigation tank adjacent to the town of the same name, having waterspread area of about 1½ sq. miles. The mud bund is about 400 yards long and quite high. A small channel leads from it to irrigate the lowlying rice fields. The bottom is muddy and free of boulders and very little vegetation is present. It practically dries up during summer.

15. *Yellareddi tank.*—It is about 3 miles from Kamareddi town and is adjacent to the Alcohol Factory. The road passes over its bund and it is a little larger than the Kamareddi tank. Although a fairly large tank, so much water is drained out for irrigation that it dries up during summer.

16. *Upalvai tank* is situated just behind Upalvai Railway Station. Its waterspread area is about 1½ sq. mile and depth about 15 ft.; it is a perennial tank. Margins are overgrown with vegetation but the deeper portions are clear. If it is exploited in a proper way, the transport of fishes will be very easy, but at present much use of it is not made owing to the lack of improved fishing tackle.

17. *Bibipet tank* is a fairly large tank having a waterspread area of about 2 sq. miles. It is situated about 7 miles to the

north-east of Bhiknur Railway Station, and the same distance from the Hyderabad-Kamareddi road, but excepting a cart-track there is no road. The embankment is of mud and quite high; total length is about 800 yards. It is an irrigation tank and contains a considerable volume of water in the winter season but during summer it is reduced to practically quarter of its size.

ARMOOR TALUQ does not contain large tanks and out of these very few are perennial. There are four small tanks round about Armoor Town and other important ones are Isapalli, Bardipur, Jokranpalli, Argul, Chepur, Balkonda, Bhusapur, Khanapur and Ahmedpur tanks. Those tanks which are near the canal have become perennial owing to the water they receive from the canal.

(*c*) *Nizamsagar Canal* originates about 1½ miles east of the dam, takes a northerly direction, passes through Banswada and Bodhan taluqs and then taking a turn to the east enters *Alisagar Reservoir*, finally reaching *Masani tank* (3 miles north-west of Nizamabad town). During its course it gives off 55 distributaries for irrigation purposes and upto its 65th mile is the perennial zone.

It continues its course through Nizamabad and Armoor *taluqs*, passing through many small tanks and the main section continues upto 96½ miles, south of Armoor town, from here it is broken up into large distributaries which in turn divide into sub-distributaries and irrigate a large area in the Armoor *taluq*. From the 65th mile, i.e. just after Masani tank, the canal remains closed for about 4 months in the year. During this period, when the canal dries up, fishes take shelter in the hollows and small tanks which are in its course and a large number is caught during the summer months.

Besides Murrels, such other fishes as come with the canal water from Nizamsagar and other tanks, develop and grow to a fairly big size. There are various spots down the canal which can easily be developed into fish-farms; the natural slope of the land provides a good drainage and the water for filling the ponds can easily be got from the canal. If the canal be stocked with quick-growing carps every year and then caught when it is closed, a large number of fishes of marketable size may be available for the market. Besides the tanks and ponds, a large number of fairly big burrow pits are present by the side of the canal which receive seepage water, these can also be utilised for fish culture.

To derive full benefit from the canal, a board, named Nizamsagar Development Board has been sanctioned with 5 lakhs[1] as annual, non-lapsable capital. Grants from this amount are extended to the Agriculture, Veterinary, Forest, Fisheries, Irrigation and other departments so that the resources at their disposal may be fully developed. Besides the departments, loans and plots are given to people for colonisation and developing the lands.

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[1] Since raised to 11 lakhs.

FISHES OBTAINED DURING THE SURVEY

S. No.	*Scientific Names*	*Telugu Names*	*Common Names*
	Fam : NOTOPTERIDAE		
1	*Notopterus notopterus* (Pallas)	Satwa	Chappal
	Fam : MASTACEMBELIDAE		
2	*Mastacembelus pancalus* (Ham.)	Bommidi	Bámni
3	*M. armatus* (Lacep.).	Pogra	Bám
4	*Rhynchobdella aculeata* (Bloch)	Malgo-pagra	Phool Bám
	Fam : ANGUILLIDAE		
5	*Anguilla bengalensis* (Gray & Hardw.)	Dungoo-Malgoo	Tamboo
	Fam : COBITIDAE		
6	*Lepidocephalus guntea* (Ham.)	Uchchal	Katmokli
7	*Nemachilus botia* (Ham.)	Buddulchey	Mooranga
	Fam : CYPRINIDAE		
8	*Chela clupeoides* (Bloch)	Ichkey	Roopchál
9	*Chela phulo* (Ham.)	Biancha	Phool chilwa
10	*Danio aequipinnatus* (McClell.)	Nooltu	Dikchi
11	*Brachydanio rerio* (Ham.)	Akkukorpil	Sundari
12	*Rasbora daniconius* (Ham.)	Ginni-gar	Korpil
13	*Esomus danricus* (Ham.)	Meesagadu	Nooria
14	*Cirrhina reba* (Ham.)	Moyyal	Rekri
15	*Barbus Puntius sarana* (Ham.)	Kangoo	Khaul
16	*Barbus Tor khudree* (Sykes)	Arrayam	Peela Mahseer
17	*Barbus Puntius Chola* (Ham.)	Perka-cháppa	Parakli
18	*Barbus Puntius Parrah* (Day)	Perka-cháppa	Parakli
19	*Barbus Puntius Kolus* Sykes	Bhigna	Kolas
20	*Barbus Puntius amphibius* (C. V.)	Perka-chappa	Parakli
21	*Barbus Puntius conchonius* (Ham.)	do.	do.
22	*Barbus Puntius sophore* (Ham.)	do.	do.
23	*Barbus Puntius ticto* Ham.	do.	do.
24	*Barbus Puntius chrysopoma* C. V.	do.	do.
25	*Labeo fimbriata* (Bl.)	Chitra	Sufĕd Rohu
26	*Labeo calbasu* Ham.	Kaki-chitra	Kali Rohu
27	*Labeo potail* (Sykes)	Baman-chapra	Chota Rohu
28	*Labeo boggut* (Sykes)	Kurmukku	Boga Rohn
29	*Labeo bata* (Ham.)	Kangu	Chitti Rohu
30	*Garra stenorhynchus* (Jerdon)	Kalgawa	Pather-chattoo
31	*Catla catla* (Ham.)	Bochchi	Katla
32	*Amblypharyngodon mola* (Ham.).	Alan-cháppa	Mola
33	*Aspidoparia morar* (Ham.)	Gitsu	Jhlrwa
34	*Rohtee cotio* var. *cunma* Day	Chinna-dammisa	Koti
35	*Rohtee vigorsii* Sykes	Kayadam	Patola
36	*Rohtee belangeri* (C.V.)	Dammisa	Chánda
	Fam : CLARIIDAE		
37	*Clarias batrachus* (Linn.)	Márpoo	Mároof
	Fam : SILURIDAE		
38	*Wallagonia attu* (Bl.)	Indgu, Aalagu	Pattan
39	*Callichrous bimaculatus* (Bl.)	Gogli	Patroo
40	*Callichrous pabda* (Ham.)	Gogli	Pábda

S. No.	Scientific Names	Telugu Names	Common Names
	Fam: HETEROPNEUSTIDAE		
41	*Heteropneutes fossilis* (Bl.) ...	Inglicum	Singi
	Fam: SISORIDAE		
42	*Bagarius bagarius* (Ham.) ...	Chikmata	Goonch
	Fam: BAGEIDAE		
43	*Mystus seenghala* (Sykes) ...	Korjella	Senghal
44	*Mystus aor* (Ham.)	Mukkul-jella	Moochala
45	*Mystus tengara* (Ham.) ...	Jella	Tengra
46	*Mystus bleekeri* (Day)	Narjella	Katarna
47	*Mystus cavasius* (Ham.) ...	Jella	do.
48	*Mystus vittatus* (Bl.)	do.	do.
49	*Mystus malabaricus* (Jerdon) ...	do.	do.
50	*Rita pavimentata* (Val.) ...	Ghegra	Peelek
51	*Rita hastata* (Val.)	Bondu	Chota reeta
	Fam: SCHILBEIDAE		
52	*Proeutropiichthys taakree* (Sykes).	Siriva-jella	Bachwa
53	*Silonopangasius childreni* (Sykes)...	Pedda-jella	Chikman
	Fam: OPHICEPHALIDAE		
54	*Ophicephalus marulius* (Ham.) ...	Phoor-chấppa.	Phool-murrel
55	*Ophicephalus striatus* (Bl.) ...	Koramata	Murrel
56	*Ophicephalus punctatus* (Bl.) ...	Gurja	Dhok
57	*Ophicephalus gachua* (Ham.) ...	Nalla-pankergaddu	Dheri-dhok
	Fam: NANDIDAE		
58	*Nandus nandus* (Ham.) ...	Pindiperka	Bheda
	Fam: AMBASSIDAE		
59	*Ambassis nama* (Ham.) ...	Sarawara	Kangi
60	*Ambassis ranga* (Ham.) ...	Sarawa	Kangi
	Fam: GOBIDAE		
61	*Glossogobius giuris* (Ham.) ...	Uskedundoo	Bálooshekra

Only the important reservoirs and tanks have been surveyed and described here, it will be a lifelong task to do the detailed survey in different seasons and it has been proposed to carry on the survey work along with the development.

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ON THE BIOLOGY OF *DANAUS CHRYSIPPUS* (LINNÆUS) AND ITS PARASITES.

BY

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Danaus chrysippus (L.), popularly known as the 'plain tiger', is one of the commonest and most widely distributed butterflies of India.

Food plant:—Sevastopulo (1933, 1938) records that the food plant of this butterfly is *Calotropis procera* R. Br. occurring in Calcutta (1938). Bingham (1905) noted that *Calotropis gigantea* R. Br. and various other Asclepiads were its food plants, and Ayyar (1940) concurred with him. Bell (1909) was of the opinion that both *C. gigantea* R. Br. and *C. procera* R. Br. served as its food plants. Jandu (1943) subscribed to the same view. We find that in Calcutta, in our college garden at Ballygunge as well as in its neighbourhood, the plant *C. gigantea* R. Br. commonly occurs but we have not come across in these localities any *C. procera* R. Br. It may be noted that *C. gigantea* R. Br. commonly occurs in Bengal, and the species *procera* is said to be occasional (Prain, 1903). Since the two species of *Calotropis*, viz. *gigantea* and procera, closely resemble each other, it is worth while considering whether there has been any confusion as to the identification of the host plant of this insect in Calcutta.

Egg laying:—The eggs of the 'plain tiger' butterfly are usually laid singly on the underside of the leaves of *C. gigantea* R. Br. It has also been noticed that the eggs are occasionally laid on the adaxial side of the leaves as well as on the stem of this food plant. This, therefore, increases the surface area of infection.

Seasonal occurrence:—We reared the larvae of this butterfly that hatched in our laboratory from the eggs obtainable from *C. gigantea*

R. Br. during the months of February and March 1945. Sevastopulo (1945) too obtained the larvae in October 1931 and in March 1943. It is said, however, to occur almost throughout the year (Lefroy, 1909). Jandu (1943) opines that this butterfly 'is specially abundant during June to November'. But observations carried on from January to September 1945 indicate that in Calcutta it is abundant mostly in February and March.

Food material:—It is generally reported that the larvae of this butterfly feed on the leaves of the host plant. Now, while this is the normal food habit, there were occasions when we came across larvae feeding on the flowers. This was not reported by the previous authors. It is well known that the colouration of the *chrysippus* larva is striking because of the bands of yellow and black on the body. But in the flower-eating forms this colour is slightly subdued. Moreover, the faecal matter of the flower-eating larvae looked pinkish buff, in sharp contrast to the greenish frass of the leaf-eating ones.

The maximum length of the larva obtainable by us from larvae reared in our laboratory was 39.4 mm.

Pupal colouration:—We obtained five kinds of dichroic pupal form—the green pale and deep, pink pale and deep, and yellow pale. Bingham (1905) states that the pupal colour is 'dichroic, some green, others pale pink or wax white'. Sevastopulo (1938) speaks of it as blue green and pinkish buff; Jandu (1943) reports it to be green or pinkish. Now out of the nine pupae which came from different stocks and were randomly picked out, we observed that among these one was pink, three pale pink, three green, one pale green, and one pale yellow in colour. The varied colours persisted throughout the pupal period. It is worth while pointing out that a parasitised pupa changed to grey. This grey colour appeared on the fourth or fifth day of pupation.

The parasites:—In a lot of ten larvae reared in our laboratory during February and March 1945, we found six of these had been parasitized by a Tachinid fly. The larvae of the Tachinid fly came out on the fifth day of pupation of the Lepidopterous insects. They issued by puncturing the pupal case just a little below the golden black border occurring round the posterior (upper) end. The dipterous larvae soon after emergence formed puparia at the bottom of the glass vial in which the pupae of the butterfly were kept. The colour of the puparia was yellow brown at first, gradually turning to dark brown. It took nine to ten days for the emergence of the fly from its puparium. It is curious to note that in a solitary case a Tachinid larva issued out from the plain tiger larva which as a result died before reaching the pupal stage. As to the number of parasites occurring within a single host, it was seen that mostly one fly emerged from one pupa, but in rare cases as many as six dipterous larvae came out of a single parasitized pupa and all these pupated at the bottom of the glass vial. Of these six puparia, emergence of only three flies could be noted.

The maximum length of the fly obtainable was 11 mm.

Now it may be asked whether *D. chrysippus* (L.) became parasitized by the Tachinid fly while it was at the egg or at the larval stage. It is generally known that a Tachinid fly parasitizes the host at its caterpillar stage and there is no record of it parasitizing its host at the egg stage of the latter. Now, we reared the caterpillars from such eggs as collected from plants in the field and kept them all through within closed vials; we fed them there with the leaves of *C. gigantea* R. Br. which were thoroughly brushed and freed from any insect egg or foreign bodies. There was no chance of the fly to come in contact with the larval host within the tube. Notwithstanding this, the flies emerged within the vials from the caterpillar hosts showing that infection must have occurred at the egg stage of the host. A table showing the dates of pupation of the Lepidopterous larva, dates of emergence of the Tachinid flies, etc. is given below. The butterfly harbours other parasitic insects as well. The eggs of this butterfly are cream-white in colour, but changed in colour if they had been infected by a Trichogrammatid (Chalcidae). Out of six eggs collected on 17-3-45 five were found parasitized. These eggs turned gradually mottled black with the development of blackish specks on it. From each egg a number of Trichogrammatids emerged on 24-3-45. The smallest number of parasitic wasps was found to be five and the highest was nine, reared from a single egg of the host. It was observed that the chalcid wasps came out by puncturing the egg just a little below its base.

No.	Date of collection of Lepidopterous egg	Date of emergence of Lepidopterous larva	Date of pupation of Lepidopterous larva	Date of issue of Tachinid larva	Date of emergence of fly
1.	25-2-45	28-2-45	10-3-45	14-3-45	23-3-45
2	25-2-45	28-2-45	10-3-45	14-3-45	23-3-45
3.	25-2-45	28-2-45	12-3-45	16-3-45	26-3-45
4.	...	1-3-45	10-3-45	14-3-45	24-3-45
5.	...	[1] 6-3-45	9-3-45	13-3-45	22-3-45
6	...	6-3-45	found dead on 8-3-45, and a Tachinid larva had pupated near it.		

Sevastopulo (1933) states that he had 'frequently bred batches of a Hymenopteron' insect 'from *chrysippus* pupae'. But we have not observed any Hymenopteron parasite from pupae, but from the eggs as noted above.

Bell (1909) reports that 'the larvae are much attacked by ichneumons' which, the authors have not yet come across in this locality.

The authors take this opportunity of recording their thanks to Mr. J. C. Banerji, M.A., of the Department of Botany, Calcutta University for the identification of the plant.

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[1] Larvae collected from the field.

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ADDENDUM

[Received for publication dated 11th Oct. 1945].

Specimens of the Chalcid referred to in our paper, as parasitizing the eggs of the butterfly *D. chrysippus* (Linnaeus) are identified by Mr. M. S. Mani of St. John's College, Agra, as *Trichogramma evanescens minutum* (Riley). He writes to us: 'It is already known from India, and in fact is being used in the control of borers of sugarcane and was also tried against teak defoliators.'

Specimens of the Tachinid flies reported in the same paper found parasitizing the butterfly were sent to Dr. C. H. Curran, American Museum of Natural History, New York, through the courtesy of T/5 Frank H. Jacobson, 975th GM Supply Det., APO 494. Dr. Curran writes that there are two species, viz. *Sturmia wainwrighti* Baranoff and *Sturmia* sp. With regard to parasitization he is of opinion: 'It is probable that these flies lay extremely small eggs on the leaves of various plants which are eaten by caterpillars. Possibly, the parasites gained access to your larvae on food fed to them.'

On the present circumstances we accept the views of Dr. Curran in thinking that the caterpillars were parasitized through the agency of their food fed to them.

At the same time the other possibility cannot be excluded. It might be that as the eggs of the Tachinid flies were very small, the butterfly laid its eggs right on the eggs of the fly and since the newly hatched caterpillar has the curious habit of eating the egg case as its first food (Bell, 1909) the developing eggs of the Tachinid were eaten along with that and thus infection occurred.

We take the opportunity of expressing our heartfelt thanks to Dr. Curran, Mr. Mani, Mr. Jacobson and Major R. Senior-White, for their kind collaboration.

OBSERVATIONS ON SOME BALANIDAE FROM MAHABALIPURAM

BY

K. S. SRINIVASAN,

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(*With a plate*)

The following account is based on the periodical observations made during 1944-45 on some barnacles from Mahabalipuram, sea-shore village in the Chingleput District, about 53 miles from Madras and south of it. Our knowledge of the Balanidae of the Madras Presidency is mainly from the records from Pamban, Krusadai Island and Madras. Altogether four barnacles are known from these localities, viz. *Balanus tintinnabulum* (Linn.) var. *communis*, Darwin, *Balanus amphitrite*, var. *venustus*, Darwin, *Balanus longirostrum*, Hoek and *Chelonobia testudinaria* (Linn.) (Gravely, 1941; Sundara Raj, 1927). The barnacles collected from Mahabalipuram, however, included *Chthamalus stellatus* (Poli) in addition to the two species of Balanus already known from Krusadai and Madras. *Chthamalus stellatus* (Poli) has not been recorded from this Presidency, so far as I know, though it is reported from the coast of Bengal (Hoek, 1913).

The coast at Mahabalipuram is almost sandy except for a small area about the temple (the Shore-temple) situated on the shore-line. In this area there are few rocks, some of which, however, are a little inside the sea. A large number of boulders are piled up along the shore, to some distance, on either side of the shore temple, to protect the same from severe wave action. A sea-groyne is also constructed in front of the temple as an additional measure of safety. The rocks and the sea-groyne are subjected to severe wave action as they are being continually dashed by the strong rolling waves, while the boulders on either side of the temple are periodically dashed by the waves during high-tide and are only splashed or sprayed during low tide. The rocks, boulders and the sea-groyne form very suitable substrata for the barnacles to settle down and grow.

The distribution of the barnacles in this area is interesting. *Balanus tintinnabulum* is mainly confined to the rocks which are a little inside the sea and constantly dashed by the waves. On these rocks, a greater settlement is seen on the faces which are not directly exposed to the waves. Peculiarly enough, this barnacle is absent on the boulders and the sea-groyne at the shore.

Balanus amphitrite is seen in association with *Balanus tintinnabulum*. It is also seen at the shore on some of the boulders and rocks, which are, however, dashed by the waves. In several cases, this barnacle is seen in larger numbers on somewhat less exposed areas, and the more exposed areas being poorly colonised or not colonised at all.

Chthamalus stellatus is perhaps the most dominant species on this shore. It is plentiful on the more exposed sides of the wave-beaten and sprayed boulders and rocks on the coast, sometimes practically to the exclusion of the other species (Figs. 1 & 2). The settlement is luxuriant in the splash zone, and it gradually decreases towards the spray zone beyond which only stray patches are seen. It is plentiful on the sea-ward side of the groyne also, but on its land-ward side and in crevices, the growth is very limited. No growth, however, is seen on completely submerged boulders, even though in their vicinity, a large number of boulders, which are not submerged had plenty of these barnacles on them. It is thus interesting to note that *Chthamalus stellatus* is abundant on more or less open situations and tends to become scarce in positions of extreme shelter and is practically absent on submerged substrata, though according to Fischer (1928) it can survive a continuous immersion of twelve months under natural conditions. My observations, however, are in general agreement with those already made on the same barnacle by Hatton (1938), Hatton & Fischer-Piette (1932), Kitching (1934-35) and Moore (1935-36).

No attempt is made to go deeply into the question of the life-history of these barnacles. However, the few observations made on the forms occurring at the shore may be recorded. After the monsoon rains, by about the end of November 1944, the barnacles came up for the first time on rocks and boulders and the sea-groyne. They occurred in a few isolated patches here and there. In the succeeding months, their number gradually increased and a maximum growth was reached by about May 1945, and in the case of *Chthamalus stellatus*, practically all rocks and boulders splashed and sprayed showed extensive patches, sometimes even replacing the vegetation that was once before on some of the boulders. By about July 1945, *Balanus amphitrite* disappeared and only a few boulders in favourable situations were seen with *Chthamalus stellatus*. Later on, however, even they were killed and their shells destroyed, either by the grinding action of the sands carried by the waves, or by the boulders themselves being gradually smothered by the deposition of sand.

The shells of many of the barnacles are attacked by boring algae such as *Mastigocoleus*, *Hyella* and *Gomontia*. *Balanus tintinnabulum* is particularly interesting in that besides the shell-boring algae already referred to, several others are also seen growing on the shell. Some algae occur either as encrustations or cushions, while others are macrophytic and grow attached to the shell by their basal system. Among the encrusting and the cushion forming types may be mentioned *Peyssonnelia*, *Lithoderma* and *Lyngbya* and among the larger forms, *Cladophora*, *Chaetomorpha*, *Ectocarpus*, *Hypnea*, *Gracilaria* and *Grateloupia*.

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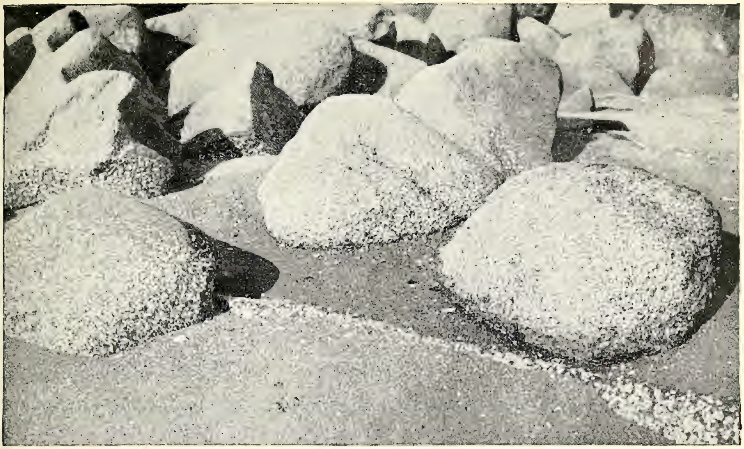

FIG. 1.

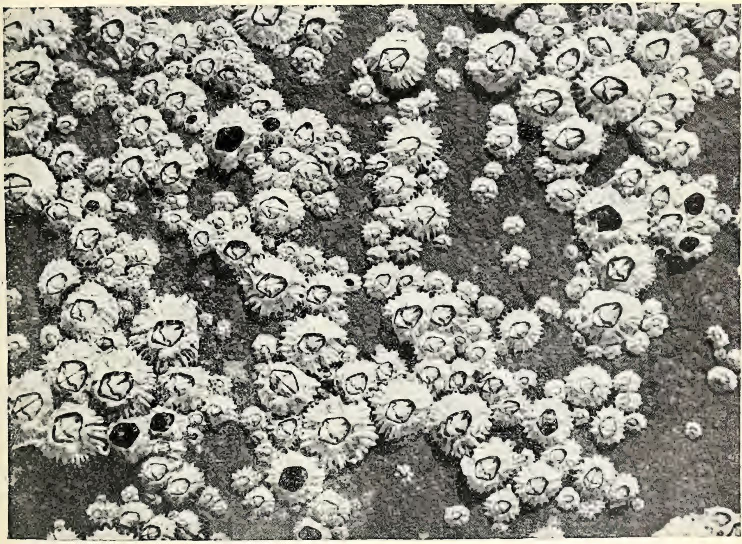

FIG. 2.

Photo by K. S. SRINIVASAN.

Balanidae from Mahabalipuram.

(For explanation see end of article).

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EXPLANATION OF FIGURES.

Fig. 1.—Photograph of a group of boulders showing extensive growth of *Chthamalus stellatus* (Poli) on the exposed and splashed surfaces.

Fig. 2.—Photograph of *Chthamalus stellatus* showing different stages of growth. ca x 2.

THE BIRDS OF THE SIMLA AND ADJACENT HILLS

BY

A. E. JONES, M.B.O.U.

PART I

INTRODUCTION.

Before commencing to enumerate the birds of these hills it may not be amiss to give a short account of the various types of terrain encountered by the traveller.

Starting from Kalka a mixture of plains and hill jungle is found; the former being represented by Mango, Pipal, Banyan, Bombax and Kikar; the latter by Bamboo and Cactus (candelabra) among many others. A little higher up the Long-Leaved Pine (*P. longifolia*) forms most of the forest growth. Next in order we come to 'Banj' Oak (*Q. incana*), Rhododendron (*R. roseus*), Deodar (*C. deodara*), Moru Oak (*Q. dilatata*), Blue Pine (*P. excelsa*), Himalayan Spruce (*Picea morinda*), Kharsu Oak (*Q. semicarpifolia*) and lastly 'Narkanda Pine' (*Abies pindrow*). Forest growth ceases at about 11,500 ft. being succeeded by Alpine conditions, pasture, crag and perpetual snow.

The Simla Hills District is divided into 27 Indian States, with an area of 4,519 square miles; Bashahr being by far the largest and at the same time the most remote. The Sutlej river passes through this State for a considerable distance, after which it divides the district from Kulu and Suket State which lie to the north. The geographical limits are confined between the parallels of latitudes 30° 20 ft. and 32° 5 ft. and longitudes 76° 30 ft. to 79° 1 ft.

The annual rainfall averages about 68 inches, most of which falls from June to September.

In the *Journal* (Vol. xxvi, No. 2, May 20, 1919) I wrote an article 'A List of Birds found in the Simla Hills 1908-1918'. It was a very incomplete list, but since its publication we have been visited by many eminent ornithologists among whom may be mentioned Hugh Whistler, C. B. Ticehurst, H. W. Waite and Bengt Berg the Swedish naturalist and author, who between them have added much fresh information to our knowledge of the avifauna of these parts. I ought also to mention my old friend P. T. L. Dodsworth who did some most valuable work and was the author of numerous articles and notes on the ornithology of Simla. S. Basil Edwardes was another very keen enthusiast and added much useful information on bird life in these hills besides writing his very useful contribution to the ornithology of Delhi.[1]

For the nomenclature I have followed Hugh Whistler in his invaluable 'Popular Handbook' and Stuart Baker in 'The Fauna of British India Birds', whose memories and unstinted help I shall always cherish.

To all those friends who have supplied me with notes and specimens I tender my best thanks. I may here remark that these records are in most cases substantiated by specimens now in the Museum of the Bombay Natural History Society;[2] all told these amounted to nearly three thousand skins collected during a residence of thirty-eight years during which time my business took me to Lahore and Ambala for the winter months. In the latter district, especially about Jagadhri, I collected a number of very interesting specimens one of which, the Black-throated Diver (*Colymbus arcticus*) was new to the birds of India.

1. **Corvus corax.** The Raven.

SIZE: That of a good sized domestic fowl. Length 24 inches.

FIELD CHARACTERS: Entirely black, including bill, legs and feet.

DISTRIBUTION: Does not occur in the Simla Hills. However, Whistler found it uncommon in some of the lower tensils of the Kangra district, and I saw it at Bakloh, 4,000 ft. and Dalhousie, 7,000 ft. in June and July, 1910.

GENERAL HABITS: Like all the Crow family this bird is a scavenger, in fact like all the *Corvidae*, it is omnivorous. The aerial gymnastics indulged in by this bird at times are fascinating to watch. Usually seen in pairs or family parties though it is not an uncommon sight to see large congregations at drinking, bathing and roosting places; these would probably be composed entirely of immigrant birds, as I have only noticed such gatherings in the cold weather. The usual call note is a deep *pruk, pruk* (Whistler) but its vocabulary covers a very wide range which includes some quite musical bell-like notes.

NIDIFICATION: Most eggs are laid in January and February, exceptionally December and March. Eggs usually number 4-7, the latter exceptionally. The nest is constructed of sticks and is placed either in a tree or on a ledge of a cliff; I once found one built in the girders of the railway bridge over the Haro River near Campbellpore.

This year, my friend Lieut. D. W. Cotton, in a communication to me records finding a nest in a cliff which contained large young ones on 27-2-46. 'Elevation approximately 5,000 ft.'

2. **Corvus macrorhynchos intermedius** Adams. The Jungle Crow.

SIZE: 18 inches; rather larger than the House Crow (*C. splendens*).

FIELD CHARACTERS: A small edition of the Raven but lacks the pointed throat hackles and has a higher pitched voice.

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[1] *Jour. B.N.H.S.*, Vol. xxxi, 261, 567.

[2] The subspecific attributions are confirmed or made by Mr. Sálim Ali on the basis of this material.—EDS.

DISTRIBUTION : The Himalayas from the foothills to 13,000 feet (Whistler) where our subspecies is known as *Corvus macrorhynchos intermedius,* but it may be worth mentioning that the birds found in the lower hills (2,500 feet to 3,500 feet) have a more mellow note, while their tails are definitely shorter, giving them, specially in flight, a more squat outline. These would, I think, be referred to the race *C. m. macrorhynchos?* Occasionally it wanders up to 6,000 feet or even more.

GENERAL HABITS : Resident throughout the year. Large numbers congregate at their favourite roosting places, where they begin to assemble at 3 p.m. leaving again before daybreak. Its aerial evolutions almost rival those of the Raven but I have never seen it indulge in the 'roll'. Dun and white specimens occur. Omnivorous.

NIDIFICATION : The nest is a small replica of that of the Raven and like that species warmly lined with wool, hair and dry grass. Eggs number from 4 to 6 and are mostly laid during the latter half of April.

3. **Corvus splendens splendens** Vieillot. The House Crow.

SIZE : 16 inches.

FIELD CHARACTERS : Crown of head and throat black, ashy gray from nape to mantle, continued on to breast, darker on flanks and abdomen; remaining plumage black glossed green, blue or purple.

DISTRIBUTION : Lower hills up to 5,000 feet; occasionally up to 7,000 feet. Colonies at Solan, Kandaghat and Subathu.

GENERAL HABITS : Tame and familiar but ever alert. Gregarious. While the Jungle Crow may be found on the edges of the larger cities, the House Crow frequents the busiest streets, docks and railway stations. Omnivorous and a cunning thief. This species is also subject to the same aberrations of colouring as the foregoing species.

NIDIFICATION : The main breeding season is during June and July. The usual materials of the exterior of the nest are slender twigs, lined with hair, dry grass, wool and rags. A number of nests examined at Kalka were made of pieces of wire. Eggs number from three to six, four or five being the usual clutch; the ground colour of the egg is blue-green blotched with umber brown and pale inky purple.

4. **Urocissa melanocephala occipitalis** Blyth. The Red-billed Blue Magpie.

SIZE : 25-27 inches, the tail being about 16 to 18 inches.

FIELD CHARACTERS : Head, throat and upper breast black; white nape patch and under parts; back, wings and long graduated tail blue grey, the last with a conspicuous white tip to each feather. The coral red bill, legs and feet distinguish it from the Yellow-billed Blue Magpie which is uncommon in the Simla Hills.

DISTRIBUTION : From Nepal, westwards to the Simla Hills where its chief stronghold is between 5,000 feet to 7,500 feet and down to 4,000 feet in winter.

GENERAL HABITS : Except in the breeding season is generally seen in small flocks or family parties threading their way through the forest. Though usually arboreal they often come to earth if anything of interest attracts them, their long tails then being held well above the ground. Has a variety of harsh raucous notes.

NIDIFICATION : Takes place from the end of April till the middle of June. The nest often placed in a most conspicuous position from 8 feet to 30 feet from the ground either in forest or the trees growing around cultivated fields. The nest is made with fine twigs and lined with dry grass and fibres. Six is the commonest number of eggs in a clutch, but I have known of one egg highly incubated; ground colour stone usually heavily blotched with sienna brown.

5. **Urocissa flavirostris cucullata** Gould. The Yellow-billed Blue Magpie.

SIZE : 26 inches, length of tail same as preceding species.

FIELD CHARACTERS : Same as *U. melanocephala* with the following exceptions: bill, legs and feet yellow; white nape patch much smaller.

DISTRIBUTION : A rare resident in the Simla Hills, found in a higher zone than the previous species. I found it much commoner across the Sutlej in Suket State. Outside our area from Murree to Assam.

General Habits : Same as the foregoing species but more addicted to the Deodar (*C. deodara*) forests above 7,500 feet.

Nidification : Similar to *U. melanocephala*.

6. **Dendrocitta vagabunda pallida** Blyth. The Indian Tree-Pie.

Size : Rather variable, between 18-20 inches, the tail about 12 inches.

Field Characters : A long tailed bird with sooty brown head and throat with a rufous body; a large pale grey patch on the wings; slaty-blue graduated tail each feather tipped black.

Distribution : In these hills up to 5,000 feet.

General Habits : Resident. Frequents open forest and the secondary growth near villages, roadside avenues and mango topes. Bold and fearless, it sometimes enters bungalows in search of food. Omnivorous.

Nidification : In Northern India most eggs are laid in April and May. The nest is loosely or compactly constructed of fine twigs, lined with grass bents and roots; it is usually built some height from the ground in a fork of a tree, sheeshum, mango and 'kikur' being the favourites. The clutch usually consists of four or five eggs but frequently only three incubated are found. These are clay coloured with deep brown blotches with underlying markings of pale ashy.

7. **Dendrocitta formosae occidentalis** Ticehurst. The Himalayan Tree-Pie.

Size : Same as the Indian Tree-Pie.

Field Characters : An ashy-grey and black long tailed bird with a dipping flight. Arboreal and extremely shy.

Distribution : Fairly common in the Oak (*Q. incana*) forests up to 7,500 feet and as low as 2,500 feet. Resident. It is curious that there should be so few records of it to the N.W. of the Simla Hills. Neither Whistler nor Hingston found it in the Dharmsala-Kangra area, though the former found it common in Mandi State (*Journ. B.N.H.S.*, vol. xxx, p. 223).

General Habits : Resident. Not uncommon. During the breeding season frequents Oak (*Q. incana*) and is then very quiet and secretive. Much more in evidence during the cold weather when it roams through cultivated areas in small parties of three to six. Call notes much as *D. vagabunda* but not so musical.

Nidification : Usually takes place from the middle of May to the beginning of June. The nest is a very slight structure of fine twigs lined with roots and is placed at no great height from the ground in a small Holly tree, Oak or Box tree with little regard to concealment. Eggs number 3 to 5, the ground colour is cream to pale stone, heavily blotched with dark brown.

8. **Garrulus lanceolatus** Vigors. The Black-throated Jay.

Size : As Common Mynah with a longer tail.

Field Characters : Head and ear coverts black, throat streaked black and white; body plumage vinous grey; wings and tail black with blue barring and white tips. Weak and undulating flight. Except in the breeding season generally seen in small parties but sometimes as many as 20 or more. Often seen feeding on the ground.

Distribution : Found from the Suleiman Hills, along the N.-W. Himalayas to Nepal. Resident up to 7,500 feet but descends to lower elevations (3,500 feet) in winter.

General Habits : Common in the immediate vicinity of Simla where it keeps mostly to the oak forests.

Nidification : At the approach of the breeding season the flocks break up into pairs and nests may be found from the middle of April till the end of May. The nest is constructed of fine twigs lined with roots and fibres. Eggs number 3 to 5 and are finely freckled with very pale red-brown on a pale sea green ground, sometimes with dark brown hair streaks.

9. **Garrulus bispecularis bispecularis** Vigors. The Himalayan Jay.

Size : Same as the Black-throated Jay.

Field Characters : A vinous fawn bird with a conspicuous white rump, black tail, wings and well defined broad moustachial streaks. A very favourable view discloses the beautiful blue barring on the wings and tail.

DISTRIBUTION: In the Simla Hills this Jay occupies a slightly higher zone than the last species, usually above 7,000 feet up to 8,500 feet, though in the winter it may descend to 6,000 feet. Its usual habitat is the grand mixed forests of the conifers and Moru Oak (*Q. dilatata*).

GENERAL HABITS: Resident; during autumn and winter wanders into the precincts of Simla, i.e. 'Jakko' and the 'Glen', but in summer retires to the forests of Mahasu and Kufri. Gregarious in the cold season when it often consorts with the former species. Note: the usual harsh screech.

NIDIFICATION: The breeding season is from mid-May to mid-June. The nest is a much more substantial structure than that of the Black-throated Jay, being made of stout twigs well felted with green moss, and is lined with roots. Not much attempt is made at concealment. Eggs number three or four. They are, in a series, distinguishable from those of the last named species by the more definite, but still very faint markings and a smoother surface.

10. **Nucifraga caryocatactes hemispila** Vigors. The Himalayan Nutcracker.

SIZE: Slightly larger than a Jay.

FIELD CHARACTERS: A dark brown bird copiously speckled with white; the white outer tail feathers are very conspicuous in flight. No white on rump or upper tail coverts.

DISTRIBUTION: The Mahasu-Kufri range in the immediate neighbourhood of Simla. Farther afield very common in the Narkanda-Baghi forest. Odd birds wander into the outskirts of Simla, mostly in autumn and winter.

GENERAL HABITS: Found in the deep forests consisting of deodar, spruce, Blue Pine (*P. excelsa*) and oak, where it is not uncommon between 6,000 feet to 10,000 feet. Its diet is varied but a large proportion consists of the seeds of the conifers, berries and insects. Its flight is buoyant and dipping and it may often be seen flying from one patch of forest to another when the white outer tail feathers are very conspicuous. The usual note often uttered on the wing is a harsh, far-reaching *kra-kra-kra* but when its young or its nests are in danger it gives vent to a low plaintive *jiu*.

NIDIFICATION: As far as I know the only nest found is the one I recorded in the *Journal B.N.H.S.*, Vol. xxv, No. 2, p. 602 as follows: 'A nest I found on March 10th, 1917, containing two young about 5 days old and an addled egg was placed 22 feet from the ground in a deodar tree; it was supported by two horizontal branches where they sprang from the main stem. In appearance it resembled a jay's, but the exterior had, besides the twigs, a certain amount of lichen and dry oak (*Q. dilatata*) leaves incorporated in it. Lined with dry grass, moss, lichen and hair. It measured externally 8 inches wide by 4 inches deep. Inside breadth 4 inches by 2¼ inches deep.

The young were clothed in white down. The egg is a broad oval. The ground colour is a very pale greenish grey and the markings, which are most numerous at the large end, consist of irregular blotches, some larger and some smaller, of umber brown with a few underlying freckles of pale inky purple. It measures 1.42 inches long by 1.07 inches wide.

The tree, in which the nest was, stands on a steep hillside facing east, and the surrounding forest, consisting of deodar, pine, oak and holly is fairly dense, though there is no undergrowth. Elevation, 7,500 feet.'

Young are out of the nest, following the old birds, by the first half of April, so it would appear that most eggs are laid by the middle of February—on the average the coldest month of the year!

11. **Pyrrhocorax pyrrhocorax** (L.) The Red-billed Chough.

SIZE: Same as House Crow.

FIELD CHARACTERS: Whole plumage glossy black with coral red bill, and legs.

DISTRIBUTION: Rarely seen in these hills and that only in winter under stress of very severe weather. T. R. Thorpe came across several at Jutogh (6,000 ft) in January, 1935; while I saw a small party on the open hillside between Kandaghat and Kereighat (5,500 ft.) in February, 1938. Waite observed it as common between Jangi to Namgia. Wynter-Blyth reported it from Daranghati.

GENERAL HABITS: Frequents the open Alpine pastures in summer from 10,000 feet to 15,000 feet. During winter descends to lower elevations.

NIDIFICATION : Breeds in holes, caves and clefts of precipitous cliffs, making a nest of sticks, lined with wool. Lays four or five eggs of a pale cream ground colour heavily blotched with pale sepia and purplish grey.

12. **Pyrrhocorax graculus graculus** (L.). The Alpine Chough.

SIZE : 15 inches.

FIELD CHARACTERS : Recognisable by its entire plumage being glossy black, short yellow bill and red legs.

DISTRIBUTION : A bird of the higher hills. Major Bowring Walsh observed it near the Kungma Pass ca. 15,000 feet and Namgia, Kunam and Jangi 9,000 feet August, 1943.

GENERAL HABITS : Same as foregoing.

NIDIFICATION : Much the same as the Red-billed Chough.

13. **Parus major casehmiriensis** Hartert. The Indian Grey Tit.

SIZE : That of a House Sparrow.

FIELD CHARACTERS : Black head, throat and abdominal stripe ; conspicuous white cheek patch ; slaty grey back and wings.

DISTRIBUTION : From the foothills it is common during the breeding season from 4,000 feet to 6,500 feet occasionally to 8,000 feet (Fagu) ; in the cold weather descends to lower elevations and spreads out into the plains.

GENERAL HABITS : A bird of the lighter forested areas, the edges of cultivation and even open hillsides where a few scattered bushes occur. Usually seen in pairs and family parties. Occasionally this bird will attach itself to the mixed hunting associations composed of Red-headed Tits, Tree-Creepers and Willow-Warblers. Its food is composed of insects of all kinds which, if too large to swallow whole, it will hold down with its strong feet and devour piecemeal.

NIDIFICATION : Takes place from mid-April to June. Some pairs I suspect have two broods, though some of the later nests are due to accidents having happened to the first attempts. The site chosen varies between a hole in a tree, an abandoned rat hole in a sloping hillside, a hole in a building or in a revetted roadside bank (the most common site). The nest is a mass of moss lined with monkey's fur. Eggs number 4 to 6 and are white speckled with red brown.

14. **Parus monticolus monticolus** Vigors. The Green-backed Tit.

SIZE : Same as the Grey Tit.

FIELD CHARACTERS : Differs from the last species by its green back and primrose yellow underparts, also the white tips to the wing feathers (secondaries).

DISTRIBUTION : Resident from 5,000 feet to 10,000 feet. Found throughout the Himalayas. I have seen it in winter at Rawalpindi, so some birds descend to the plains at this season though I think this is exceptional.

GENERAL HABITS : A forest bird and common in the oak belt, less so in pure deodar. Its food consists mainly of insects and in this connection it is worth mentioning that I have seen it more than once feeding on the Pierid butterfly *Aporia agathon* as these come to the flowers of the Horse Chestnut.

NIDIFICATION : Differs in no way from that of the foregoing species, nesting sites and materials being similar. The eggs differ slightly from the Grey Tit's in being rounder, more obtuse and more heavily blotched. They number four to six, though Whistler mentions eight.

15. **Machlolophus xanthogenys xanthogenys** Vigors. The Yellow-cheeked Tit.

SIZE : Same as above.

FIELD CHARACTERS : This very attractive bird is easily recognised by the presence of the black crest, the longer feathers tipped with buff. Yellow supercilium and yellow cheeks, otherwise the colouring is much the same as the Green-backed Tit.

DISTRIBUTION : This race occurs in the N.-W. Himalayas from Murree to Nepal.

GENERAL HABITS : Very capricious in its choice of habitat. Only oak (*Q. incana*) seems to suit it and even in large tracts of other apparently suitable forest it is entirely absent. Never found in the deodar forests. The breeding zone is from 5,500 feet to 7,000 feet. Waite noted it at Bahli and Sungri (*J.B.N.H.S.* Vol. 45, No. 4, p. 533) which is exceptionally high.

Nidification : The site chosen for the nest is a hole in a tree from the level of the ground to 20 feet or more. The materials are a pad of moss in which the nest proper is formed and lined with fur. Eggs usually number four in a full clutch and closely resemble those of the Grey Tit but the markings are fewer and finer.

16. **Lophophanes melanolophus** Vigors. The Crested Black Tit.

Size : Length 4 inches.

Field Characters : Body, wings and tail iron grey with a black head, crest, throat and breast; conspicuous white cheeks; grey under parts, rust coloured flanks and two wing bars of pale rufous.

Distribution : Common in the deodar forests around Simla from 6,000 ft. to 11,000 ft. Descending to slightly lower elevations in the cold weather. During the winter of 1932 I found it not uncommon in Rawalpindi.

General Habits : Shows a decided preference for the coniferous forests. A very restless sprightly little bird. Its food consists mainly of insects, seeds and berries. Frequently comes to ripe sunflower heads for the seed. Very sociable and most of the foraging associations one encounters contain a few of this species.

Nidification : Takes place from April to June. Sometimes double brooded. Favourite sites for the nest are a natural hole in a tree or in a revetment wall. Moss constitutes the main foundation of the nest, the receptacle for the eggs being warmly lined with fur and hair. The clutch consists of from five to eight eggs which are white with rusty red blotches often forming a zone round the larger end.

17. **Lophophanes rufonuchalis rufonuchalis** (Blyth). The Simla Tit.

Size : 4½ inches.

Field Characters : Might be confused with the foregoing but, apart from its slightly superior size, lacks the rufous wing-bars.

Distribution : A bird of the higher elevations from 9,000 feet to the tree limit. Common in Lahoul in the Juniper forests between 10,000 feet and 12,000 feet (Whistler). In the Simla Hills it is not uncommon in the Narkanda-Baghi area. Some birds in the N.W. descend to the plains in the cold season, for I obtained specimens at Rawalpindi and Sang-jani during the winter of 1927. But this must be exceptional considering the fact that both Hugh Whistler and H. W. Waite were stationed there and never encountered it.

General Habits : Another bird of the coniferous forests with all the same cheery demeanour of the above.

Nidification : Whistler appears to be the only ornithologist to give us any information on this phase of its economy. He found two nests containing young on 2nd and 4th June respectively. These were placed under large stones embedded in the hillside (*Ibis*, Jan. 1925, p. 165) 'the nests were of the usual soft materials'.

18. **Lophophanes dichrous dichrous** (Blyth). The Brown-crested Tit.

Size : 4 inches.

Field Characters : A plain brown bird with red irides and a brown crest and the vestiges of a buff colour.

Distribution : During the breeding season found from 9,000 feet up to 10,500 feet or more. In winter slightly lower, e.g. at Theog 7,500 feet, Kufri and Mahasu 8,500 feet.

General Habits : Much the same as other members of this genus but I found it more addicted to deciduous growth as well as the stunted *Quercus semecarpifolia*.

Nidification : The only information regarding this point we owe to B. B. Osmaston who found it nesting at Deoban 9,000 feet in Garhwal. He says the hole containing the nest had evidently been excavated by the parent birds. The nest was composed of moss copiously lined with grey hair. Five fresh eggs were found in one nest and were of the usual white, spotted all over, but mainly at the large end with red brown. Date 30/4. Sálim Ali found a nest with chicks in the same locality on May 1936.

19. Lophophanes rubidiventris (Blyth). The Rufous-bellied Crested Tit.

SIZE : 4½ inches.

FIELD CHARACTERS : No wing bars. Slightly smaller than the Crested Black Tit which, except for the rust red of the belly, it closely resembles in general colouring.

DISTRIBUTION : In our district this species was obtained at 11,000 feet on the *Chor* mountain by H. C. Smith and recorded by me, *vide J.B.N.H.S.*, Vol. xliv, No. 3, p. 474. Extends as far as Nepal.

GENERAL HABITS : Nothing recorded.

NIDIFICATION : Not known.

20. Sylviparus modestus simlaensis Stuart Baker. The Yellow-browed Tit.

SIZE : 4 inches.

FIELD CHARACTERS : A small olive green bird, underparts slightly paler. Tail slightly forked. The yellow brow is only visible when the bird is in the hand.

DISTRIBUTION : A bird of fairly high elevations. About Simla it is found in the cold weather from October to March between elevations of 6,000 feet and 8,000 feet.

GENERAL HABITS : An active little bird usually found associating with the hunting parties composed of Red-headed Tits, Tree Creepers, Goldcrests, etc. Apparently only one bird is attached to each of these assemblies. Note like English Blue Tit—rarely uttered.

NIDIFICATION : Not known. Summer distribution? See Waite's note *J.B.N.H.S.*, Vol. xlv, No. 4, p. 533.

21. Aegithaliscus concinnus iredalei Stuart Baker. The Red-heated Tit.

SIZE : 4 inches.

FIELD CHARACTERS : The red head, black cheeks and throat should be sufficient to identify this little bird but it should be mentioned that the young ones lack the black throat. Upper plumage pure slaty grey ; lower plumage pale russet ; iris cream.

DISTRIBUTION : Resident from 5,000 feet to 8,000 feet in the Simla district, and down to 3,000 feet in winter.

GENERAL HABITS : Except while nest-building, incubating and tending the young while they are in the nest, this small bird is seen in family parties and small flocks. They pair off in February or early March. Unlike other tits which roost in holes this species favours a more or less sheltered branch or twig in a bush or shrub where the party all huddle together for warmth. This habit was disastrous to their numbers in January, 1945, when Simla (as well as other parts of the Hills) was visited by a snowstorm which fell to a depth of seven to ten feet. The result was, that of this usually common species, at the commencement of the breeding season, very few pairs remained to rear their broods of young. This state of affairs was confirmed by several of my correspondents.

NIDIFICATION : Takes place in normal seasons in March and April, most nests contain the full complement of eggs by the end of the former month. The exterior of the nest is mainly composed of green moss with the addition of spiders' webs and lichen. The lining consists of feathers of various other birds, principally of fowls and pheasants. The birds present a quaint sight carrying a feather almost as large as themselves! The clutch consists of from four to six eggs in these parts. The nest is placed from almost ground level, in a bush or over-hanging grass a foot from the ground, to 40 feet up a deodar.

22. Ægithaliscus niveogularis Gould. The White-throated Tit.

SIZE : 4 inches.

FIELD CHARACTERS : The white throat, black eye-stripe and broad brown pectoral band are diagnostic.

DISTRIBUTION : Mr. & Mrs. Pring found it not uncommon at Talra, Taroch State, Simla Hills at an elevation of 11,000 feet in May and June. Stuart Baker's record of eggs sent him by Dodsworth, whom I knew very well, must be due to some mistake. Dodsworth never worked the higher elevations.

GENERAL HABITS : Very similar to the above species. A bird of deciduous forests, i.e. Silver Birch, Cherry, etc.

NIDIFICATION : The breeding season is stated to be May and June. The nest is very similar to that of the Red-headed Tit. B. B. Osmaston found a nest on June 11, placed 10 feet from the ground in a Cherry tree. It contained half fledged young. This was in the Tons Valley, Garhwal, 'just below the snows'.

23. **Sitta himalayensis** Jard. and Selby. The White-tailed Nuthatch.

SIZE : 5 inches.

FIELD CHARACTERS : Upper plumage slaty blue ; underparts from throat pale rufous shading to a deeper tone on the abdomen and under tail coverts ; white bases to the central tail feathers (not easily seen in the field) ; black eye stripe. Sexes alike.

DISTRIBUTION : Not uncommon in oak forests in the neighbourhood of Simla. Resident from 6,500 feet to 9,000 feet.

GENERAL HABITS : Arboreal. Seen usually in pairs and family parties, often attaches itself to the mixed foraging associations of small birds. A bird of the tree trunks running either up or down in its tireless search for food. Note : a sharp *twit-twit*. In Spring a pleasant trill is uttered.

NIDIFICATION : The breeding-season is from mid-March to the end of April. A small hole, usually one in an oak, is selected for the nursery. If the hole is too large the entrance is contracted to suit the size of the bird's body by plastering it with clay. The cavity is lined with chips of dead leaves on which the eggs lie. The clutch consists of three to six eggs which are white with red blotches. The hole may be from 4 feet to 50 feet from the ground.

24. **Sitta leucopsis leucopsis** Gould. The White-cheeked Nuthatch.

SIZE : 5 inches.

FIELD CHARACTERS : Differs from the above in having the sides of the face white, also in having the crown of the head black ; underparts shading from cream on throat and breast to deep russet on the abdomen and flanks.

DISTRIBUTION : Resident from 7,500 feet to 10,000 feet. Rare in Simla. A flock seen on 'Jakko', 8,000 feet.

GENERAL HABITS : Practically the same as the White-tailed Nuthatch but whereas *himalayensis* prefers oak forest this species is a bird of the conifers. Its usual call-note is well described by Whistler, i.e. a plaintive, tinny, *quair-quair*.

NIDIFICATION : As far as I can discover Col. R. H. Rattray is the only ornithologist who has taken the eggs of this species. He found the bird fairly common round Dunga Gali and Miranjani, above 8,000 feet, Murree Hills. He says (*J.B.N.H.S.*, Vol. xvi, p. 424), 'A common nesting site is high up in a tall fir tree that has been struck by lightning and cracked down the centre ; a convenient place in this crack is selected. Eggs 5 to 8 in number.' I found a nest in a similar situation near Kufri ; the old birds were feeding young.

(*To be continued*)

ON THE CORRECT NAME OF THE TIBETAN SHRIKE USUALLY CALLED *LANIUS TEPHRONOTUS*

BY

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In his excellent monograph of the shrikes M. Olivier tentatively adopted the name *nipalensis* for the Tibetan Shrike, usually called *Lanius tephronotus* (op. cit., p. 48, 208), following the nomenclature employed by the workers of the British Museum (Ticehurst, Whistler, and Kinnear). However, Olivier remarks correctly that the question of the name of this species is by no means settled and that he believes *'que cette question devra etre considérée à nouveau.'*

In the following paragraphs an attempt is made to present such a renewed consideration of the nomenclature of this species. The obvious conclusion, to be drawn from the herewith presented evidence, is that there is no reason for transferring the name *tephronotus* Vigors from the Tibetan Shrike to a population in the western Himalayas.

The Type-Locality of *Lanius tephronotus* Vigors.

This shrike was described by Vigors in the *Proceedings of the Zoological Society of London* for 1830-31, page 43, from a collection of some sixty species received by Gould from the 'Himalayas'. Some of these specimens were illustrated by Gould in his simultaneously published *A Century of Birds of the Himalaya Mountains.* The name of the collector and the localities at which the specimens had been collected were, apparently deliberately, suppressed by Vigors and Gould. When, in the course of years, it was found that many of the sixty species described by Vigors had different subspecies in the eastern and western Himalayas, various authors restricted the type-localities of the species in the Vigors-Gould collection either to the eastern or western Himalayas. However, there is much evidence that the greater part of the collection came from a single area and that this area was the Simla-Almora district of the western Himalayas. Ticehurst and Whistler (1924, *Ibis,* pp. 468-73) therefore took the drastic step of restricting the type localities of all the sixty species described by Vigors to the Simla-Almora district in the western Himalayas. This action necessitated a radical shift of type-locality for no less than ten species as well as a change of names for several of them. How Ticehurst and Whistler thought they could justify their action is not quite apparent to me since they themselves admit that several of the species of the Gould collection are not now found in the Simla-Almora district (*Myiophoneus horsfieldi, Otis himalayanus, Otis nigriceps,* and *Garrulax ocellatus*). Neither does *Pericrocotus brevirostris* occur in the western Himalayas as pointed out by Bangs (1930, *Bull. Mus. Comp. Zoöl.,* 70, p. 297) and by Mayr (1940, *Ibis,* pp. 714-15). Hartert (*Vögel pal. Fauna,* p. 925) and later Rothschild 1926, *Novit. Zool.,* 33, p. 239) pointed out that the specimen of *Dryobates hyperythrus* illustrated by Gould undoubtedly belonged to the eastern Himalayan race, and that there was no excuse to shift the type locality to the western Himalayas and to rename the eastern Himalayan form. It is obvious from this evidence that the Vigors-Gould collection was a composite one, and that it contained material from the eastern Himalayas and perhaps from other parts of India, in addition to the Simla-Almora material.

By far the most injurious effect of the wholesale shifting of type localities was that it resulted in the shifting of the name *Lanius tephronotus* Vigors from the well-known Tibetan Shrike, to which this name had been applied for nearly one hundred years, to a shrike of the western Himalayas. Whistler and Kinnear (1933, *Jour. Bombay Nat. Hist. Soc.,* 36, pp. 336-37) apply the name *tephronotus* to a local population of shrikes found in Lahul and the Suru Valley and use for the Tibetan Shrike the name *nipalensis* Hodgson.

This confusing transfer of names is unjustified and unnecessary for the following reasons:

(1) The name *tephronotus* has been applied to the Tibetan Shrike with such unanimity for the ninety-three years between 1831 and 1924 that only compelling reasons would justify a transfer. However, the only reasons advanced by Ticehurst and Whistler are vague conjectures.

(2) Even if the entire Gould-Vigors collection had been collected in the western Himalayas, it would still be unwarranted to reject the name *tephronotus* for the Tibetan Shrike since it is quite possible that the species is found in the western Himalayas as an occasional winter visitor or straggler. It has been reported breeding as far west as Garhwal (Whymper), although these birds may not have been typical *tephronotus.*

(3) The fact that Vigors described both *erythronotus* and *tephronotus* in the same work indicates that the gray-backed shrike he had before him was the very distinct Tibetan bird and not a specimen of the Lahul population which is much more similar to *erythronotus.* This is strengthened by the original description of *tephronotus* which states that the back is gray, the tail brown and implies that the white wing-spot is absent. These characters are valid for the Tibetan bird but not for the Lahul population. It is doubtful whether Vigors would have applied the name *tephronotus* (=gray-backed) to the Lahul population.

(4) Stuart Baker had already restricted the type locality of *L. tephronotus* to Gyantse, Tibet, which is in the breeding range of the Tibetan Shrike. This action definitely tied the name *tephronotus* to the Tibetan Shrike. Admittedly the type specimen of *tephronotus* cannot have been collected at Gyantse which around 1830 was quite inaccessible. Stuart Baker, after many years of residence in India, was surely fully aware of this. His full restriction of the type-locality reads: 'Himalayas, Gyantse, Tibet,' which may be interpreted to read: 'Winter visitor to the foothills of the Himalayas, typical breeding population at Gyantse, Tibet.' The rules of nomenclature state nothing about the selection of type localities, but it seems that it should be permitted to suggest a breeding range type locality for a bird that was described from its winter quarters. However, to avoid any possible criticism I shall rephrase Stuart Baker's wording and hereby fix the type-locality of *L. tephronotus* as follows: 'Foothills of the Himalayas near Darjeeling, where breeding birds of the Gyantse district may be expected to winter.' In view of the proven composite nature of the Vigors-Gould collection, Baker's restriction of the type-locality of *L. tephronotus* to the eastern Himalayas cannot be rejected, even though other parts of that collection came from the western Himalayas.

The shift of the name *tephronotus* was not accepted by Dunajewski in his revision of the *Lanius schach* group (1939, *Jour. Ornith.*, 87, p. 38) nor by the majority of the other non-British authors. Retention of the name *tephronotus* for the Tibetan Shrike, to which it has been applied by the majority of authors since 1831 therefore does not cause any confusion, as would the shift of this name to the Lahul population as proposed by Whistler and Kinnear.

The application of the name *tephronotus* to the Tibetan Shrike leaves without a name the Lahul population to which Whistler and Kinnear had transferred the name *tephronotus*. However, Dunajewski states that this population is but little distinct from *erythronotus* and that the name *L. jourotus* Hodgson may be available for it (1939, *J. Ornith.*, 87, p. 38).

Whether or not *Lanius tephronotus* Vigors is a distinct species still seems to be an open question. In the east where *tephronotus* and *schach tricolor* meet, there is no sign of intergradation. However, this may be due to a vertical gap between the ranges of the two forms. In the west, it is stated by Whistler and Kinnear (op.cit., p. 336) that there is a complete intergradation between *erythronotus* and the Tibetan Shrike. This is denied by Dunajewski (op. cit., pp. 30-35). A renewed study of the shrikes of Garhwal, Kumaon, West Nepal and the adjoining districts of Tibet will surely decide this point. It is quite possible that these shrikes present another case of circular overlap of races, and that *tephronotus* acts with *schach* like a good species in the eastern Himalayas, but intergrades with it in the western Himalayas. It is significant that among all the races of *schach* the one which is morphologically most similar to *tephronotus*, namely *erythronotus*, is also the only one which, like the Tibetan Shrike, has become adapted to the high mountains.

NOTES ON A COLLECTION OF BIRDS FROM MADRAS PRESIDENCY[1]

BY

WALTER KOELZ

In 1937 I spent from January 21 to March 27 in Madras Presidency on a botanical mission. During a part of this period I was able to devote my spare time to making a collection of birds. The principal localities and dates for such collections follow: Mahendra Giri and environs (now in Orissa Province) January 21-30; Ellore, February 2; Nilgiri Hills (crest) February 14-21; Palni Hills (crest), March 10-15; Nilambur, February 23 and March 3-6; Malabar Coast: Tellicherry, February 25; Kasargod, February 27; Mangalore, March 1; Kodur, March 18, 19; Cuddapah, March 19, 20; Sidhout, March 20-23; Hospet, March 24, 25.

In the series of papers on 'The Vernay Scientific Survey of the Eastern Ghats' (Ornithological Section) by Hugh Whistler, assisted by N. B. Kinnear, beginning in the *Journal of the Bombay Natural History Society*, Vol. xxxv, p. 505, and ending in Vol. xxxix, p. 463, has been given a resumé of the existing data on the occurrence and distribution of birds in Madras Presidency.

The present collection has yielded data on species not given in this resumé and on many forms of which, up to now, there have been but few records in the area under consideration.

The specimens referred to are preserved in my collection.

Dendrocitta formosae sarkari Kinnear and Whistler.

A male was taken January 23, 1937 on Mahendra Giri, W 139 mm.

Dendrocitta vagabunda parvula Kinnear and Whistler.

A female taken at Nilambur, March 5', W 134 mm.

Dendrocitta vagabunda vernayi Kinnear and Whistler.

Male taken at Sidhout, March 22, W 151 mm. Female taken at Kodur March 18, W 144 mm.

Dendrocitta leucogastra Gould.

Common at Nilambur where four were taken February 23, March 4 and 5, W 3 ♂ 142-149, ♀ 146 mm.

Parus major stupae Koelz.

Three ♂ and two ♀ were taken at Ootacamund, February 14 and 16.

Machlolophus xanthogenys aplonotus (Blyth).

Three specimens were taken on Mahendra Giri, January 24, 25.

Machlolophus xanthogenys travancorensis Kinnear and Whistler.

Three specimens were taken at Kodaikanal, March 10, 11.

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[1] The manuscript of this useful paper was received in 1939 just before the War started. The undue delay in its publication is regretted. The editors take no responsibility for the several new races introduced by the author. The last word on the validity of many of them has yet to be said. Readers are referred to the comments of the late Hugh Whistler on some of these new Indian races (described by Dr. Koelz in *Proc. Biol. Soc., Washington*, 52, June 5, 1939, pp. 61-82) in Vol. xliii of the *Journal, B.N.H.S.*, pp. 33-38—EDS.

Sitta frontalis simplex Koelz.

Specimens taken: Mahendra, January 24, 25, ♂, 2 ♀♀; Ootacamund, February 14, 16, 2 ♂♂, 3 ♀♀; Kodaikanal, March 10, ♀.

Trochalopteron cachinnans cachinnans (Jerdon).

Three specimens were taken at Ootacamund, February 14, 16.

Trochaloteron jerdoni fairbanki Blanford.

Common at Kodaikanal where 6 specimens, W 88-91 mm., were taken March 10-14.

Turdoides griseus griseus (Gmelin).

Male taken at Coimbatore, February 11, W 109.5 mm.; and at Sidhout, March 21, W 106 mm.

Turdoides somervillei terricolor (Hodgson)

Female, W 102 mm., was taken on Mahendra Giri on January 22; and a ♂ W 102.5 mm., at Kodur, March 18.

Turdoides somervillei malabaricus (Jerdon)

A female W 106 mm., was taken at Nilambur on February 23.

Crateropus caudata caudata (Dumont).

Three males were collected at Cuddapah, March 19, W 73-81 mm., and one at Hospet, March 25, W 76 mm.

Crateropus malcolmi (Sykes).

Two juveniles taken at Hospet, March 24 and 25.

Pomatorhinus horsfieldi horsfieldi (Sykes).

Common on Mahendra Giri were 4 adults: 3 ♂♂ W 88-96.5, ♀ 91 mm., and 2 juveniles were taken on January 23 and 24.

Pomatorhinus horsfieldi travancoreensis Harington.

Common in the Palnis and Nilgiris. Specimens collected: Ootacamund, February 14-16, 2 ♂♂ W 99, 100.5, ♀ 94 mm.; Kunjapani, February 20, ♂ ♂ 99 mm.; Nilambur, March 4, ♂ 97 mm.; Kodaikanal, March 10-14, 5 ♂♂ 92-97 mm., and 2 juveniles.

Dumetia hyperythra hyperythra (Franklin).

2 ♂♂ W 53, 55 mm., were taken on Mahendra Giri on January 23, 24.

Dumetia hyperythra albogularis (Blyth).

A female, W 55 mm., was taken at Sidhout on March 22.

Chrysomma sinensis hypoleuca (Franklin).

Specimens taken: Saba, January 27, ♂ W 65 mm.; Kodur, March 8, W 67 mm.; Sidhout, March 21 and 22, 3 ♂♂ W 67.5-71, ♀ W 61.5 mm.; Hospet, March 25, ♂ 69 mm.

Pellorneum ruficeps ruficeps Swainson.

Four males were taken on Mahendra Giri on January 24 and 25, W 70-74.5 mm.; and one at Kunjapani, February 20, 1937, W 74 mm.

Mixornis gularis rubricapilla (Tickell).

A pair was taken on Mahendra Giri on January 25, W 59, 60.5 mm., and a ♂ at Bengasai next day, W 60 mm.

Alcippe poioicephala poioicephala (Jerdon).

4 males, W 67-72 mm., were taken at Kunjapani on February 20.

Alcippe poioicephala brucei (Hume).

Specimens taken on Mahendra Giri are like specimens from Londa, Bombay Presidency. Wings measure: 4 ♂♂ 69.5-71.5; 2 ♀♀ 70 mm.

Rhopocichla atriceps atriceps (Jerdon).

A pair was taken at Kunjapani on February 19 and 20; and at Nilambur on March 3. Wings measure 53 (juv), 56 and 55·56 mm., respectively.

Aegithina tiphia humei Stuart Baker.

Specimens taken: Mahendra, January 22, ♂ W 64.5 mm.; Bengasai, January 26, ♂ and ♀ W 65, 64 mm.; Rati, January 29, ♂ W 66.5, ♀ 64 mm.; Kunjapani, February 20, ♂ W 64 mm.; Mangalore, March 1, 2 ♂♂ W 64 mm.; Nilambur, March 6, ♂ W 63.5 mm.; pair at Kodur, March 18, W 64, 65.5 mm.; Cuddapah, March 20, ♀ W 65 mm.; Hospet, March 25, ♂ W 63.5 mm.

Chloropsis aurifrons davidsoni Stuart Baker.

Specimens were taken: Mahendra Giri, January 22, ♂ W 92 mm.; Bengasai, January 26, 2 ♀♀ 84.5, 85 mm.; Nilambur, March 3-5, 2 ♂♂ W 87, 91, 2 ♀♀ 83.5, 84 mm.; Kodur, March 18, ♂ W 90 mm.

I have skins of 2 pairs from Nilambur, probably topotypical *davidsoni*, that measure ♂♂ 87, 91, ♀♀ 83.5, 84 mm. Whistler and Kinnear (*J.B.N.H.S.*, xxxv, p. 751) separate their race *insularis* of Ceylon on the grounds of having shorter wing than *davidsoni* of Malabar and give measurements 6 ♂♂ 91-94; 3 ♀♀ 87.5-88.5 mm. They apparently should have named the race of which they list specimens from Shevaroy Hills, Palkonda Hills, Nallamalai Hills and Anantagiri, all in Madras Presidency, with wing measurements 6 ♂♂ 95-101.5; 4 ♀♀ 91.5-95 mm. Strangely I have 3 birds from Mahendra Giri, a little north of Anantagiri that measure ♂ 92, ♀ 84.5, 85 mm.

Microscelis psaroides ganeesa (Sykes).

Common at Ootacamund and Kodaikanal, where 2 ♂♂, W 118, ♀ 112 mm., and 3 ♀♀ W 110-113 mm., were taken February 14 and March 10-14, respectively.

Molpastes cafer cafer (Linnaeus).

A ♀ W 85.5 mm., was taken at Kunjapani on February 19; and a juvenile at Nilambur, March 3.

Molpastes cafer saturatus Kinnear and Whistler.

Specimens taken: Bengasai, January 26, ♂ W 99 mm.; Kodur, March 18, 2 ♂♂ W 96, 98, 2 ♀♀ 90, 91 mm.; Cuddapah, March 20, ♀ W 90 mm.; Hospet, March 24, ♂ W 97.5 mm.

Otocompsa jocosa fuscicaudata (Gould).

Specimens taken: Ootacamund, ♀, February 14; Nilambur, 2 ♂♂, March 2, 3; Kodaikanal, 4 ♂♂ and a ♀, March 10-14.

Iole icterica intensior Koelz.

Three specimens were taken at Kunjapani on February 19 and 20; and one at Kodaikanal, March 15.

Pycnonotus gularis (Gould).

2 ♀♀ W 73.5, 79.5 mm., were taken at Nilambur, March 3, 5.

Pycnonotus luteolus luteotus (Lesson).

Common in the vicinity of Mahendra Giri and specimens were taken : Bengasai, January 26, 2 adult males, W 90.5, 93 and a pair of juveniles; Rati, January 29, ♂ W 87 mm.; a juvenile female was taken at Nilambur, March 5.

Microtarsus poioicephalus (Jerdon).

A ♀ W 75 mm., was taken at Kunjapani on February 20; and a ♂ W 78.5 mm., at Nilambur on March 2.

Tarsiger brunnea brunnea (Hodgson).

4 ♀♀ W 73.5-76, were taken on Mahendra Giri, January 22-24; and one W 73 mm., February 14 at Ootacamund.

Saxicola caprata caprata (Linnaeus).

♂ taken at Hospet on March 25.

Saxicola caprata atrata (Kelaart).

Specimens taken : Ootacamund, February 16, 2 ♂♂ W 76; 3 ♀♀ 72-74 mm.; Kodaikanal, March 10-14, 2 ♂♂ W 81, 2 ♀♀ 74 mm. Two ♀ from Tellicherry, February 25, are smaller, W 69 mm., and intermediate with *rupchandi*.

Phoenicurus ochrurus rufiventris (Vieillot).

A ♂ W 87 mm., was taken at Rati, January 29.

Calliope calliope (Pallas).

A ♀ W 76 mm., was taken on Mahendra Giri, January 25.

Saxicoloides fulicata intermedia Whistler.

Specimens were taken : Mahendra, January, 26, ♂ W 73 mm.; Rati, January 27, 28, 2 ♂♂ W 72, 74 mm.; Kodur, March 18, 2 ♂ W 74, 76, ♀ W 72 mm.; Hospet, March 25, ♂ W 78 mm.

Copsychus saularis saularis (Linnaeus).

Specimens taken : Rati, January 27, ♀ W 96.5 mm.; Kunjapani, February 19, 21, ♂ W 104.5, ♀ 96 mm.; Mangalore, March 1, ♂ W 100 mm.

Kittacincla malabarica malabarica (Scopoli).

Males were taken : Kunjapani, February 20, 21, W 98.5, 99; Kodur, March 18, W 88 mm.

Turdus simillimus simillimus Jerdon.

Three ♂♂ W 131-134, ♀ 127 mm. taken at Ootacamund, February 14-17.

Turdus simillimus bourdilloni (Seebohm).

3 ♂♂ W 120-125, 3 ♀♀ 125-129 mm., taken at Kodaikanal, March 10-14.

Turdus simillimus mahrattensis Kinnear and Whistler.

Two ♀♀ W 120, 121 mm., taken at Nilambur, March 3, 4.

Turdus simillimus spencei Kinnear and Whistler.

♂ W 130.5 mm., taken on Mahendra Giri, January 24.

Turdus unicolor Tickell.

A ♀ W 118 mm., was taken on Mahendra Giri, January 23.

Geokichla citrina cyanotus (Jardine and Selby).

A ♂ W 112 mm., was taken on Mahendra Giri, January 25; at Nilambur, March 3-6, 2 ♂♂ W 109-110, 3 ♀♀, 103-109 mm.

Oreocinchla dauma neilgherriensis Blyth.

A ♀ W 127 mm., was taken at Ootacamund, February 16.

Monticola cinclorhyncha (Vigors).

Specimens taken: Mahendra Giri, January 22, 25, 2 ♂♂ W 103, 104, ♀ 101 mm.; Kunjapani, February 19, ♂ W 105, ♀ 100.5 mm.

Monticola solitarius pandoo (Sykes).

Two ♀♀ W 117, 118 mm., were taken on Mahendra Giri, January 24, 25.

Mophonus coeruleus horsfieldii Vigors.

Specimens were taken at Nilambur, March 3.

Muscicapula superciliaris astigma Hodgson.

A ♀ taken on Mahendra Giri, on January 22, W 62 mm. One taken on the 23 and one on the 24, W 59, 61.5 mm., are of the typical race.

Cyornis pallipes pallipes (Jerdon).

Specimens collected: Kunjapani, February 19, 21, 2 ♂♂ W 76.5, 77.5 mm.; Kodaikanal, March 10, 15, 3 ♂♂ W 77-78 mm.

Cyornis rubeculoides rubeculoides (Vigors).

Specimens collected: Kunjapani, February 19, ♂ W 72.5 mm.; Nilambur, March 3, 2 ♂♂ W 72.5, 77 mm.

Eumyias albicaudata (Jerdon).

Specimens taken: Ootacamund, February 14-16, 2 ♂♂ W 79, 81.5, 4 ♀♀ 75-78 mm.; Kodaikanal, March 10-12, ♂ W 82, 2 ♀♀ 76, 78.5 mm.

Eumyias thalassina thalassina Swainson.

Specimens taken: Mahendra, January 23, W 79; Kunjapani, February 19, 20, 2 ♂♂ W 82, 84, ♀ 80 mm.

Alseonax latirostris poonensis (Sykes)

Specimens taken: Kunjapani, February 20, ♂ W 70 mm.; Tellicherry, February 25, 2 ♂♂, W 71.5, 73.5 mm.; Nilambur, March 4, ♂ W 75 mm.

Ochromela nigrorufa (Jerdon).

Common at Ootacamund and Kodaikanal. Four specimens from each locality: W 2 ♂♂ 63, 2 ♀♀ 57, 58; 3 ♂♂ 61-63.5, ♀ 55.5 mm., respectively.

Culicicapa ceylonensis ceylonensis (Swainson).

Specimens collected: Mahendra Giri, January 25, ♂ W 64 mm.; Ootacamund, February 14, 2 ♂♂ W 64, 67.5, ♀ 60.5 mm.; Kodaikanal, March 10-13, 3 ♂♂ W 60-65, ♀ 60.5 mm.

Tchitrea paradisi paradisi (Linnaeus).

Specimens taken: Kunjapani, February 20, ♂ W 97.5 mm.; Mangalore, March 1, ♀ W 91 mm.; Nilambur, March 5, ♂ W 92.5 mm.

Hypothymis azurea sykesi Stuart Baker.

Specimens taken: Bengasai, January 23-26, 3 ♂♂ W 71, ♀ 68 mm.; Kunjapani, February 19, 20, 3 ♂♂ W 64.5-69.5, ♀ 71 mm.; Mangalore, March 1, ♀ W 70 mm.; Nilambur, March 2-4, 2 ♂♂ W 68, 73, ♀ 70 mm.

Leucocirca aureola compressirostris Blyth.

Two ♂♂ W 80, 86 mm. and a ♀ W 76.5 mm. were taken at Sidhout, March 20-22.

Leucocirca pectoralis vernayi Kinnear and Whistler.

Specimens taken: Mahendra Giri, January 23, 24, ♂ W 77, ♀ 72.5 mm.; Kodur, March 18, ♀ W 70.5 mm.; Hospet, March 25, ♀ W 70.5 mm.

Lanius vittatus Valenciennes.

Specimens taken: Rati, January 27, 30, ♂ W 87, ♀ 84.5 mm.; Cuddapah, March 20, ♀ W 81.5 mm.; Sidhout, March 21-23, 4 ♂♂ W 82.5-87, 2 ♀♀ 83, 84 mm.

Lanius schach caniceps Blyth.

Specimens taken breeding: Ootacamund, February 15-17, 3 ♂♂ W 88-97, ♀ 93 mm.; Kodaikanal, March 10, 2 ♀♀ W 87, 90.5 mm.; Nilambur, March 3, 4, 2 ♂♂ W 91.5, 92.5 mm. Other specimens: Kodur, March 18, ♂ W 91 mm.; Sidhout, March 22, ♂ W 92 mm.; Hospet, March 24, 25, ♂ W 88.5, 2 ♀♀ 88, 93.5 mm. This is a well-marked race.

Lanius cristatus cristatus Linnaeus.

Specimens taken: Nilambur, March 3, 4, ♂ and ♀ W 87 mm.; Kodaikanal, March 11, ♂ W 86 mm.

Lanius cristatus phoenicuroides (Schalow).

A specimen was taken on Mahendra Giri, January 23, ♂ W 86.5; and at Bengasai, January 26, ♀ W 83.5 mm.

Lanius excubitor lahtora (Sykes).

Specimens taken: Cuddapah, March 19, ♀ W 106.5 mm.; Sidhout, March 21, 22, 2 ♂♂ W 106.5, 107.5 mm.

Hemipus picatus picatus (Sykes).

At Ootacamund on February 14, 15, were taken 3 ♂♂ W 63, 2 ♀♀ 63, 65 mm. (one female laying); and at Kunjapani, February 19, a male W 63 mm.

Tephrodornis gularis sylvicola Jerdon.

Specimens taken: Kunjapani, February 19, 21, 2 ♂♂ W 116, 117, 2 ♀♀ 116 mm.; Nilambur, March 3, ♀, W 121 mm.

Tephrodornis pondicerianus pondicerianus (Gmelin).

Specimens taken: Kodur, March 19, ♂ W 84 mm.; Cuddapah, March 20, ♀ W 84 mm.; Sidhout, March 22, ♂ W 86, 2 ♀♀ 84, 85.5 mm.; Hospet, March 24, ♂ W 87 mm.

Tephrodornis pondicerianus warei Koelz.

Two ♂♂ W 86.5, 89 mm., in rather worn plumage taken at Mangalore on March 1, appear to be of this form.

Pericrocotus flammeus (Forster).

At Kunjapani, February 19, 20, were taken 4 ♂♂ W 92-93, ♀ 93 mm.

Pericrocotus cinnamomeus cinnamomeus (Linnaeus).

A pair was taken at Kunjapani, February 19, 20, W 71, 69 mm.

Pericrocotus cinnamomeus malabaricus (Gmelin).

At Nilambur, March 3, 5, were taken ♂ W 71, 2 ♀♀ 68, 71 mm.

Pericrocotus cinnamomeus sidhoutensis Koelz.

Specimens taken: Kodur, March 18, ♂ W 65.5, ♀ 65 mm.; Sidhout, March 21-23, 3 ♂♂ 65.5-67, ♀ 65.5 mm.

Lalage sykesi sykesi Strickland.

Specimens taken: Ootacamund, February 14, ♂ W 103 mm.; Nilambur, March 3, ♀ W 102.5, March 5, ♂ 98.5 mm.; Kodur, March 18, 19, 2 ♂♂ W 104, 105.5 mm.; Sidhout, March 21, 22, ♂ ♀ W 102, 104 mm.; Hospet, March 25, ♂ W 103 mm.

Graucalus javensis macei Lesson.

A female W 163 mm., was taken at Mandasa on January 21; and a male W 159, 2 ♀♀ 157, 159 mm., at Kunjapani, February 19, 20.

Dicrurus macrocercus peninsularis Ticehurst.

A female W 134 mm., was taken March 1 at Mangalore; and a pair March 21, 22, W 146, 137 mm., at Sidhout.

Dicrurus coerulescens coerulescens (Linnaeus).

A female W 121 mm., was taken at Kunjapani, February 19.

Dicrurus longicaudatus longicaudatus (Jerdon).

Specimens taken: Mahendra Giri, January 23, 24, 4 ♂♂ W 137.5-144 mm.; Kunjapani, February 14, 21, ♂ W 136 mm.

Chaptia aenea malayensis Blyth.

Four ♂, W 115.5-121 mm., were taken at Kunjapani on February 20; and one at Nilambur, March 2, W 118.5 mm.

Dissemurus paradiseus malabaricus (Latham).

A male was taken at Nilambur, February 23, W 155 mm.

Acrocephalus dumetorum Blyth.

Specimens taken: Mahendra Giri, January 23, 24, 2 ♂♂, ♀; Bengasai, January 26, ♀; Rati, January 29, ♀; Ootacamund, February 16, 2 ♂♂, ♀; Kunjapani, February 19, 20, 2 ♀♀; Nilambur, February 23, March 2 and 3, 4 ♀♀; Kodaikanal, March 10, 11, ♂ ♀.

Acrocephalus agricola agricola Jerdon.

A female W 60 mm., was taken at Ellore, February 2.

Orthotomus sutorius sutorius (Forster).

Specimens taken: Kunjapani, February 19, 21, 3 ♂♂. Two males taken at Nilambur, March 2, 5 are intermediate with the next.

Orthotomus sutorius londae Koelz.

3 females taken at Mangalore, March 1; a male taken at Kodur, March 18; a female at Cuddapah, March 20; and 3 ♂♂ on Mahendra Giri, January 25, 26 are near this form.

Franklinia gracilis gracilis (Franklin).

Specimens collected: Bengasai, January 22, ♂ W 48 mm.; Kunjapani, February 20, ♀ W 44 mm.; Kodur, March 18, ♂ ♀, W 47, 45 mm.

Phragmaticola aedon aedon (Pallas).

Specimens taken: Bengasai, January 26, ♂ W 87 mm.; Nilambur, February 23, March 5, 2 ♀♀ W 80 mm.

Hippolais caligata rama (Sykes).

At Kodur, on March 18, were taken 2 males W 61 mm., 2=6-7; at Sidhout, March 22, ♂ W 56.5 mm., 2=7-8.

Sylvia hortensis jerdoni Blyth.

A male was taken at Rati on January 28.

Phylloscopus affinis (Tickell).

At Ootacamund, February 14-16, were taken 2 ♂♂ W 60, 61, 3 ♀♀ 55-61.5 mm.; and at Kodaikanal, March 11, a ♂ W 55.5 mm.

Phylloscopus inornatus humei (Brooks).

4 specimens taken on Mahendra Giri, January 24.

Phylloscopus nitidus nitidus Blyth.

A specimen was taken March 1 at Mangalore, W 64 mm.

Phylloscopus nitidus viridanus Blyth.

2 ♂♂ W 59, 60.5, ♀ 59 mm., were taken on Mahendra Giri, January 23, 24; and a ♂ W 63 mm., at Kodaikanal, March 10.

Phylloscopus magnirostris Blyth.

Two specimens were taken at Ootacamund, February 14, 15.

Phylloscopus occipitalis occipitalis (Blyth).

Specimens taken: Mahendra Giri, January 24, ♂; Kunjapani, February 19, ♂; Kodaikanal, March 12, ♂.

Seicercus burkii burkii (Burton).

A male was taken on Mahendra Giri, January 23.

Prinia socialis socialis Sykes.

Specimens were taken: Ellore, February 2, ♀ W 45.5 mm.; Sidhout, March 22, ♂ W 47, 2 ♀♀ 45, 47 mm.; Hospet, March 25, ♂ W 49.5 mm.

Prinia sylvatica sylvatica Jerdon.

Two males were taken at Sidhout, March 22, W 56, 60 mm.

Prinia sylvatica palniensis Koelz.

Three specimens were taken at Ootacamund, February 15, 16; and 3 at Kodaikanal, March 11-14.

Prinia sylvatica mahendrae Koelz.

3 specimens were taken on Mahendra Giri, January 23-25.

Prinia inornata inornata Sykes.

Specimens were taken: Ellore, February 2, ♀ W 45.5 mm.; Sidhout. March 21, 22, ♂ W 49.5, ♀ 46 mm.

Prinia inornata franklinii (Blyth).

A female W 53 mm., was taken at Kodaikanal on March 11.

Irena puella puella (Latham).

A male W 131 mm., was taken February 21 at Kunjapani.

Oriolus oriolus kundoo Sykes.

Specimens taken: Kunjapani, February 20, ♂ W 141 mm.; Nilambur, March 5, ♀ W 141 mm.; Sidhout, March 20, 21, 2 ♂♂ W 140, 142 mm.; Cuddapah, March 20, ♂ W 137 mm.

Oriolus chinensis diffusus Sharpe.

Specimens taken : ♂ W 151 mm., at Rati on January 29 ; ♀ W 153.5 mm., at Nilambur, March 5.

Oriolus xanthornus maderaspatanus Franklin.

Specimens collected : Mahendra Giri, January 23, ♀ W 129 mm. ; Bengasai, January 26, ♂ ♀, 137, 128 mm. ; Sidhout, March 22, ♂ 132 mm.

Temenuchus pagodarum pagodarum (Gmelin).

Specimens taken : at Saba, January 27, ♂ Mandasa, January 30, ♂ ; Nilambur, March 3, 5, ♂ breeding, ♀ ; at Cuddapah, March 19, ♀ ; Sidhout, March 21, 22, 3 ♂♂, 4 ♀♀ ; Hospet, March 25, ♂.

Aethiopsar fuscus mahrattensis (Sykes).

A male W 129 mm., was taken at Ootacamund, February 16 ; and a female W 124 mm., at Kodaikanal on March 10.

Lonchura striata (Linnaeus).

Three specimens taken at Mahendra, January 25, 26 are rather intermediate between the typical race and *acuticauda*. One taken at Kunjapani on February 20 is a juvenile and its status isn't clear. A female taken at Nilambur on March 2 appears to be *estriata*.

Lonchura malabarica (Linnaeus).

Three specimens were taken at Kodur on March 18.

Lonchura punctulata lineoventer (Hodgson).

A male was taken from a flock at Hospet, March 25.

Erythrina erythrina roseata (Blyth).

Specimens taken : Mahendra Giri, January 24, ♂ ♀, W 85 mm. ; Ootacamund, February 14, ♂ ♀, W 86.5, 81.5 mm. ; Kodaikanal, March 10, ♂ W 87 mm.

Gymnoris xanthocollis xanthocollis (Burton).

Three breeding specimens taken at Nilambur, March 4.

Passer domesticus indicus Jardine and Selby.

A male was taken at Ootacamund on February 18 ; and at Cuddapah March 20.

Riparia rupestris Scopoli.

A ♂ W 132.5 mm., was taken on Mahendra Giri on January 23.

Riparia concolor (Sykes).

A male was taken on Mahendra Giri, January 24, W 108.5 mm. ; and a female at Hospet on March 24, W 105 mm.

Hirundo rustica gutturalis Scopoli.

A female was taken at Ellore, February 2, and at Sidhout, March 22, W in both 111 mm.

Hirundo javanica domicola Jerdon.

A female was taken at Ootacamund, February 16, W 105 mm.

Hirundo smithii filifera Stephens.

A male W 107 mm., was taken at Hospet, March 24.

Hirundo daurica nipalensis Hodgson.

Two specimens were taken at Bengasai, January 26.

Motacilla alba dukhunensis Sykes.

2 ♀♀ were taken at Kasargod, February 27, W 85 mm.

Motacilla maderaspatensis maderaspatensis Gmelin.

A male was taken at Nilambur, March 4.

Motacilla cinerea caspica (Gmelin).

A ♀ was taken at Ootacamund, February 15.

Anthus hodgsoni inopinatus Hartert and Steinbacher.

Specimens taken: Mahendra, January 24, 2 ♂♂; Ootacamund, February 14, 16, pair; Kodaikanal, March 14, ♂, 2 ♀♀.

Anthus nilghiriensis Sharpe.

Specimens taken: Ootacamund, February 16, 2 ♀♀ W 75, 76.5 mm.; Kodaikanal, March 10, 14, 5 ♂♂ W 77-81 mm.; 4 ♀♀ W 73-77 mm.

Anthus campestris godlewskii (Taczanowski).

Specimens taken; Rati, January 27, ♀ W 90.5 mm.; Tellicherry, February 25, 2 ♀♀ W 86.5, 88 mm.; Kodur, March 18, ♂♀, W 91, 87 mm.

Anthus rufulus malayensis Eyton.

Specimens taken: Mahendra Giri, January 24, pair; Rati, January 28, 30, pair; Ellore, February 2, ♂; Ootacamund, February 14, 16, 2 ♂♂, ♀; Kasargod, February 27, 2 ♂♂; Nilambur, March 4, ♀; Kodaikanal, March 14, ♂; Hospet, March 24, ♀.

Alauda gulgula australis Brooks.

Specimens taken: Ootacamund, February 15, 16, 2 ♂♂ W 96, 102, ♀ W 90 mm.; Kodaikanal, March 10-14, 4 ♂♂ 95, 2 ♀♀ W 89, 90 mm.

Calandrella brachydactyla dukhunensis (Sykes).

9 ♂♂, 2 ♀♀, mostly molting, were taken at Ellore, February 2.

Mirafra cantillans bangsi Koelz.

4 specimens taken at Hospet, March 25.

Mirafra affinis Jerdon.

Specimens taken: Bengasai, January 27, 2 ♂♂ W 83, 84.5 mm.; Kasargod, February 27, 2 ♂♂ W 84, 86 mm.; Mangalore, March 1, ♂ W 84.5 mm.; Nilambur, March 5, ♂ W 89 mm.

Galerida malabarica malabarica (Scopoli).

4 specimens were taken at Tellicherry, February 25; and one at Mangalore, March 1.

Ammomanes phoenicura phoenicura (Franklin).

Specimens taken: Ellore, February 2, 2 ♂♂ W 107, 110, ♀ 100 mm.; Kodur, March 18, ♂ W 105 mm.; Sidhout, March 22, ♀ W 102 mm.; Hospet, March 25, ♀ W 107 mm.

Eremopterix grisea grisea (Scopoli).

Specimens taken: Mandasa, January 21, 3 ♂♂ W 75-78.5, 2 ♀♀ 75 mm.; Ellore, February 2, 2 ♂♂ W 74, ♀ 74 mm.; Coimbatore, February 11, ♂ W 76, 2 ♀ 73 mm.; Kodur, March 18, 5 ♂♂ W 73-77, 2 ♀ 74 mm.; Sidhout, March 21 juvenile; Hospet, March 24, ♂ W 76.5 mm.

Zosterops palpebrosa palpebrosa Temminck and Schlegel.

Three males were taken on Mahendra Giri on January 24.

Zosterops palpebrosa nilgirensis Ticehurst.

At Ootacamund, February 14, 16, 2 ♂♂ and a ♀ were taken; at Kunjapani, February 20, 3 ♂♂.

Zosterops palpebrosa palniensis Koelz.

5 specimens were taken at Kodaikanal on March 11, 12.

Cinnyris lotenia (Linnaeus).

2 ♂♂ were taken at Nilambur, March 2, 4.

Cinnyris asiatica brevirostris (Blanford).

A male was taken at Sidhout, March 22.

Cinnyris minima (Sykes).

A pair was taken at Kunjapani, February 19; and 3 ♂♂ at Nilambur, March 2-5.

Cinnyris zeylonica (Linnaeus).

Specimens taken: Mahendra, January 22, 26, ♂♀; Tellicherry, February 25, ♂; Kasargod, February 27, ♂; Nilambur, March 2-4, 3 ♂♂, ♀; Kodur, March 18 ♀; Sidhout, March 22, ♂, Hospet, March 25, ♂.

Dicaeum concolor concolor Jerdon.

5 specimens were taken at Ootacamund, February 16; 5 at Kunjapani, February 19, 20; 7 at Kodaikanal, March 10-15.

Dicaeum erythrorhynchos erythrorhynchos (Latham).

Specimens taken: Mahendra, January 22, 23, 2 ♂♂; Mangalore, March 1, ♂, 2 ♀♀; Kodur, March 18, pair; Hospet, March 25, ♀.

Piprisoma agile saturatior Koelz.

Two males, taken at Kunjapani, February 19, are near this form.

Pitta brachyura brachyura (Linnaeus).

Specimens were taken: Mangalore, March 1, 2 ♂♂ W 104, 108 mm.; Nilambur, March 4, ♂ 108 mm.

Picus chlorolophus chlorigaster (Jerdon).

Specimens taken: at Kunjapani, February 19, 20, 2 ♂♂, ♀; at Nilambur, March 3, ♀.

Dryobates mahrattensis mahrattensis (Latham).

A male W 103.5 mm., was taken at Kunjapani on February 19.

Dryobates hardwickii hardwickii (Jerdon).

At Kunjapani a ♂ was taken February 20, a ♀ on the 21st; at Nilambur a ♂ on March 5.

Brachypternus benghalensis puncticollis (Malherbe).

A male was taken at Mahendra on January 22.

Brachypternus benghalensis tehminae Whistler.

A female was taken at Mangalore, March 1.

Chrysocolaptes guttacristata socialis Koelz.

At Kunjapani, February 19-21, were taken ♂, 2 ♀♀.

Hemicircus canente cordatus Jerdon.

A pair was taken at Nilambur, March 5.

Vivia innominatus innominatus (Burton).

2 ♂♂, taken at Mahendra on January 22, 23, are near the typical form.

Iynx torquilla.

A female taken on Mahendra Giri, January 25, is like most Indian birds I have seen, intermediate between the typical race and *japonica.*

Thereiceryx viridis (Boddaert).

Specimens taken: Ootacamund, February 16, 2 ♀♀, W 99, 100.5; Kunjapani, February 19, 20, 2 ♂♂ W 104, 109, ♀ 107 mm.; Pittambi, February 23, ♂ W 102 mm.; Tellicherry, February 25, ♂ W 99 mm.; Mangalore, March 1, ♂ W 99 mm.; Nilambur, March 5, ♂ W 93.5 mm.

Xantholaema haemacephala indica (Latham).

Specimens taken: Bengasai, January 26, ♂; Kunjapani, February 19, ♀; Kodur, March 19, pair.

Hierococcyx sparveroides (Vigors).

A ♂ was taken at Ootacamund on February 16.

Hierococcyx varius (Vahl).

Specimens taken: Ootacamund, February 14, ♂ W 191.5 mm.; Kunjapani, February 19, 20, 3 ♀♀ W 183-190 mm.; Nilambur, February 23, 2 ♂♂ 184, 195 mm.

Cacomantis merulinus passerinus (Vahl).

A male was taken at Kunjapani, February 21, W 107 mm.

Penthoceryx sonneratii sonneratii (Latham).

A ♂ was taken at Bengasai on January 26, W 126 mm.

Eudynamis scolopaceus scolopaceus (Linnaeus).

A ♂ was taken at Rati on January 27; and a ♀ at Nilambur, March 5.

Rhopodytes viridirostris (Jerdon).

Two ♂ were taken at Nilambur, March 3, 6.

Centropus sinensis parroti Stresemann.

A male was taken at Saba on January 27; and a ♀ at Rati on the 29th.

Psittacula krameri manillensis (Bechstein).

A ♂ was taken at Cuddapah, March 20, W 165 mm.

Psittacula cyanocephala cyanocephala (Linnaeus).

Specimens taken: Mahendra, January 25, ♂; Kunjapani, February 20, ♀; Nilambur, February 23, ♂.

Psittacula columboides (Vigors).

A specimen was taken at Kunjapani, February 20.

Coryllis vernalis rubropygius Stuart Baker.

A male was taken at Kunjapani on February 20.

Coracias benghalensis indica Linnaeus.

A male was taken at Nilambur, March 5, and at Hospet, March 24.

Eurystomus orientalis orientalis (Linnaeus).

A male was taken at Nilambur, March 5.

Merops orientalis orientalis Latham.

Specimens taken: Mahendra, January 26, ♀; Rati, January 30, ♀; Sidhout, March 22, ♂.

Merops superciliosus javanicus Horsfield.

A female was taken at Ellore, February 2; and at Kasargod on the 27th.

Merops leschenaulti leschenaulti Vieillot.

Two ♂♂ were taken at Kunjapani on February 19; and one at Nilambur, March 3.

Alcemerops athertoni athertoni (Jardine and Selby).

A pair was taken at Kunjapani on February 20.

Ceryle rudis leucomelanura Reichenbach.

A ♀ was taken at Palasa on January 30.

Ceryle rudis travancoreensis Whistler.

A ♀ was taken at Nilambur on March 4.

Tockus birostris birostris (Scopoli).

Specimens taken: Saba, January 27, pair; Rati, January 28, pair; Hospet, March 24, ♀.

Tockus griseus griseus (Latham).

Two ♂♂ were taken at Nilambur, February 23, March 3.

Harpactes fasciatus malabaricus (Gould).

Two ♂♂ were taken at Kunjapani, February 20; and a ♂ and 2 ♀♀ at Nilambur, March 2-6.

Harpactes fasciatus legerli Koelz.

A male was taken at Mahendra on January 22.

Tachornis parvus batasiensis (Gray).

A male was taken at Rati on January 29, W 110 mm.; at Kunjapani on February 19, ♀ W 120. On 20th, ♂ 115 mm.

Caprimulgus macrourus atripennis Jerdon.

A male was taken at Kunjapani, February 20, W 179 mm.; and at Nilambur on February 23, ♂ W 175; on March 5, ♀ W 166 mm.

Caprimulgus asiaticus asiaticus Latham.

Specimens taken: Bengasai, January 26, 2 ♂♂ W 150, 151.5 mm.; Sidhout, March 22, ♂ W 141, ♀ 146.5 mm.

Strix indranee indranee Sykes.

A male was taken at Kunjapani, February 19, W 325 mm.; and one at Nilambur, March 3, W 328 mm.

Bubo bengalensis (Franklin).

A male W 351 mm., was taken at Sidhout on March 22.

Athene brama brama (Temminck).

A female W 157 mm., was taken at Saba on January 27.

Glaucidium radiatum malabaricum Sharpe.

At Nilambur, February 23, March 4-6, were taken 3 ♂♂ W 123-129, 2 ♀♀ W 127, 131 mm.

Ninox scutulata hirsuta (Temminck).

A male was taken at Nilambur on March 5, W 207 mm.

Falco chicqnera chicquera Daudin.

A male was taken at Cuddapah, March 20.

Falco tinnunculus objurgatus (Stuart Baker).

A male was taken at Ootacamund, February 15; and a ♀ at Hospet, March 25.

Limnaëtops cirrhatus cirrhatus (Gmelin).

A female was taken at Bengasai, January 26, W 422 mm.

Butastur teesa (Franklin).

A female W 282 mm., Rati, on January 29.

Circus macrourus (Gmelin).

9 male W 338 mm.; was taken at Rati on January 29.

Accipiter badius dussumieri (Temminck).

Two females W 197, 201 mm., were taken at Sidhout, March 22.

Accipiter virgatus besra Jerdon.

A male in immature plumage was taken at Ootacamund, February 16, W 156 mm.

Pernis cristatus ruficollis (Lesson).

Specimens taken: Kunjapani, February 20, ♂ W 420 mm.; Mangalore, March 1, ♀ W 421 mm.; Nilambur, March 5, ♂ W 375 mm.

Treron phoenicopterus chlorigaster (Blyth).

2 ♀♀ taken at Mahendra on January 22, are near this form.

Treron bicincta bicincta (Jerdon).

A male was taken January 25 at Mahendra.

Columba elphinstonii (Sykes).

A male was taken at Ootacamund, February 16.

Streptopelia decaocto decaocto (Frivalszky).

A male was taken at Kodur on March 18, W 169 mm.; and at Sidhout on the 21st, W 165 mm.

Gallus gallus gallus (Linnaeus).

A female was taken on Mahendra Giri on January 24, W 210 mm.; common

Gallus sonneratii Temminck.

Specimens taken: Ootacamund, February 14, 16, pair; Nilambur, March 3, 2 ♀♀; Kodaikanal, March 14, ♀.

Galloperdix spadicea spadicea Gmelin.

Specimens taken: Mahendra, January 25, 2 ♂♂ W 150, 157 mm.; Nilambur, March 3-6, 2 ♂♂ W 149, 152, 2 ♀♀ 141, 149 mm. and a juvenile.

Perdicula asiatica asiatica (Latham).

A pair, taken at Bengasai on January 26, are probably of this race.

Metopidius indicus Latham.

A male was taken at Mandasa on January 26.

Charadrius dubius curonicus Gmelin.

A ♀ W 120 mm., was taken at Rati, January 28.

Lobipluvia malabarica (Boddaert).

A male was taken at Sidhout on March 22.

Scolopax rusticola indica Hodgson.

A specimen was taken at Ootacamund on February 16.

Capella gallinago (Linnaeus).

A ♂ was taken at Kasargod, February 27.

Egretta alba modesta (Gray).

A ♂ W 364 mm., was taken at Ellore on February 2.

Butorides striatus abbotti Oberholser.

A male W 171 mm., was taken at Nilambur, March 4.

Nettapus coromandelianus coromandelianus Gmelin.

Four specimens were taken at Ellore on February 2.

Anas querquedula Linnaeus.

Two males were taken at Ellore on February 2.

TWO NEW LOCAL RACES OF THE ASIATIC WILD ASS

BY

The late R. I. Pocock, F.R.S.,

(*Zoological Dept., British Museum, Natural History*).

The discovery of two local races of Asiatic Wild Asses requiring new names owing to their having been previously wrongly identified was one of the first and most interesting results of my examination of the skins and skulls of the five specimens of the race from Kutch, which, as announced by Sálim Ali (*Journ. Bomb. Nat. Hist. Soc.*, 46, pp. 472-477, 1946), were most generously presented to the British Museum by H. H. Maharao Shri Vijayarajji, when he learnt from the Society, through Mr. W. S. Millard on information I supplied, that the national collection possessed only a single example of this animal. The latter was kindly sent to me in 1940 by H. H. the Maharaj Kumar of Bikanir, as he then was, who procured it from Prince Madansinhjii of Kutch, the race being extinct, as he informed me, in Rajputana.

The scientific name of this race is *Microhippus hemionus khur,* originally described as *Equus khur* by Lesson in 1827. Its synonymy and distinguishing characters and my reasons for adopting the generic name *Microhippus* instead of *Equus* or *Asinus* for the Asiatic wild asses will be discussed in a future paper. In the present communication I propose to deal merely with the essential features in which the two new local races differ from the race still inhabiting Kutch, where it is strictly preserved by H.H. the Maharao. Additional details of these two will be also included in the aforesaid paper.

MICROHIPPUS HEMIONUS BLANFORDI subsp. nov.

(Blanford's Gor Khar)

Equus onager var. *indicus,* Blanford, Mamm. Brit. India p. 470, 1891 (in part; not *indicus* Sclater, 1862, which is a synonym of *khur*).

Locality of the type (Brit. Mus., 91.5.13.1): The Sham Plains, lat. 29°20′ N., long. 69°40′ E., formerly in E. Baluchistan but now included in Wazaristan.

Distribution: Unknown apart from the locality of the type.

Diagnosis: Distinguished essentially from the Gor Khar of Kutch (*M.h. khur*) by the noticeably greater inferior extension of the rather darker fawn tint of the upper side and the corresponding reduction of the white on the lower side of the head, neck and body; the rump-patch also is less extensive and more obscure. The winter coat in February is also fuller, longer and more wavy, especially on the spinal stripe where it is upstanding.

The skull, which is that of a mature but youngish female, with the facial sutures unfused, differs from that of *M.h. khur* of nearly the same age in its comparatively low crown, lacking the marked convexity of that area as exhibited for example by the skull of Sálim Ali's specimen No. 3 which approaches it more nearly in age. In that respect the skull of *M.h. blanfordi* resembles that of the Kiang (*M.h. kiang*).

In its coloration this new race closely approaches the Syrian and Mesopotamian race (*M.h. hemippus*); but the latter is a much smaller animal, with a strongly convex forehead.

The type and only known example of *M.h. blanfordi* was shot by W. T. Blanford in 1882. Not improbably the race is now extinct; but any information about the wild asses of Baluchistan would be most welcome.

MICROHIPPUS HEMIONUS BAHRAM subsp. nov.

(The Persian Gor Khar)

? *Equus onager indicus,* Lydekker, Novit. Zool. 11, p. 588, pl. xvii, 1904 (not *indicus,* Sclater).

Equus onager onager. Lydekker, Cat. Ung. Mamm. 5, p. 14, 1916 (not *onager* Boddaert and others).

Asinus hemionus khur. Schwarz, Zool. Garten, 2, p. 85-90, 1929 (not *khur* Lesson).

Locality of the type. (Brit. Mus., 10.7.12.2): Yezd, Central Persia, lat. 32°N., long. 55°E.

Distribution: Only known with certainty from the locality of the type.

Diagnosis: Resembling the Gor Khar of Kutch (*M.h. khur*) in the average proportions of the pigmented and white areas of the head, neck and body but differing in the luxuriance of the winter coat which is from 40 to 45 mm. long, thick and strongly curled, instead of 20 to 25 mm., comparatively thin and only slightly wavy; in the colour which is drabby, greyish brown, instead of sandy fawn; in the extension of the spinal stripe as a strong black line to the tuft of the tail; in the shorter chestnuts on the fore legs and in its narrower hoofs.

Of this race I have seen the flat skins of three specimens (10.7.12. 1-3) shot by R. C. Barker and E. J. Blackman at Yezd. Although undated, unmeasured, unsexed and without skulls, they are obviously in winter coat, are presumably adult, since they equal the Kutch skins in size, and are presumed to be females from the presence of a pair of well developed teats on each. Their individual variations will be described later.

In 1916 Lydekker entered these skins in his catalogue under *Equus onager onager*, although they disagree with all the descriptions of that race, including his own in 1904. In the typical Onager, which ranges as far south as Kaswin in Northern Persia, the white areas invade the upper part of the body, neck and head to a greater extent than in any other race. The Gor Khar, which Lydekker described and figured as *Equus onager indicus* was alleged to have been captured at Meshed in north-eastern Persia. I suggest that the illustration may represent *M.h. bahram* in summer coat; and I have no doubt that that conclusion is true of the wild ass Schwarz identified as *Asinus hemionus khur*, which was living in the Berlin Zoological Gardens and was shipped from Bushire. Although being in summer coat it differed from the winter skins of the Yezd series in its paler hue, it resembled them in the conspicuous extension of the spinal stripe to the tail-tuft, which is not the case in the skins from Kutch, and in the presence of a pronounced black rim above the hoofs such as is shown in the type of *M.h. bahram*, although it is fainter in another of the skins and absent in the third; being obviously a variable feature. It is undeveloped, however, in any of the skins of typical *M.h. khur* from Kutch.

REVIEW

AN INSECT BOOK FOR THE POCKET. By Edmund Sandars. Oxfo
University Press. Price 10/6*d.* nett.

One of the difficulties facing the amateur entomologist has been the lack of any simple yet reasonably comprehensive handbook. 'An Insect Book for the Pocket' supplies this want with conspicuous success.

As there are over 20,000 species of insects in the British Isles obviously the author could not deal with more than a small proportion of them and one of the major problems of authorship was what to include and what to omit. That Major Sandars's selection of species has been judicious will be seen by anyone who studies the book. Except for such 'small' insects as are of outstanding interest or importance he has wisely confined his choice to 'large' insects, that is to insects of over 1 inch wing expanse and half an inch length for, as he states in his preface, small insects are generally only noticed when they get into our eyes and lose their interest as soon as they have been successfully wiped out. In addition he has included information about other creatures commonly referred to as 'insect' . . . Spiders, Woodlice and Centipedes.

Stress has been laid on habits and life history and only the essential characters have been included in the descriptions. There are, however, numerous coloured plates and the text is full of illustrations, almost all of which are life size. The descriptions of habits and life histories are very full and most interestingly written, there is a commendable lack of technical language, and, what is unusual in a book of this type, the author frequently displays a keen sense of humour.

Whether there is any particular virtue in the literal translations the author has given for specific and generic names I doubt, though it is possibly entertaining to know that *Calliphora vomitoria* (the Large Bluebottle) means the Emetic Beauty-bearer and that *Ilyocoris cimicoides* means the Buglike Mudbug!

Although this little volume is small enough to fit very easily into the pocket, it should not be thought that its contents are of the same stature. Its 350 pages of small print contain a vast mass of information, much of which will be useful to students in India as many of the species are closely allied to insects found in this country.

M. A. W-B.

The following books have been added to the Society's library:—

1. CHECK-LIST OF THE BIRDS OF THE WORLD. Vols. I-V. By James Lee Peters (Harvard University Press, Cambridge, Mass.—1931-1945)

2. BIRDS IN THE GARDEN AND HOW TO ATTRACT THEM. By Margaret McKenny (University of Minnesota Press, Minneapolis—1939)

3. POISONOUS ANIMALS OF MALAYA. By M. W. F. Tweedie (Malaya Publishing House Ltd., Singapore—1941)

4. TREES OF INDIA. By Charles McCann (Taraporevala & Sons, Bombay—1946)

5. FAR RIDGES. By J. K. Stanford (C. & J. Temple Ltd., London—1946)

AN APPEAL

Egg Enquiry

Observations and experiments carried out in the Middle East during the War have shown: (*a*) that there is a wide variation in the palatability of the flesh of various birds; (*b*) that meat-eating animals, belonging to unrelated groups, such as the hornet, cat and man, show a general agreement in their preference for, or avoidance of, particular bird-species; and (*c*) that among birds otherwise liable to predatory attack, there is a general correlation between conspicuousness of the plumage and distastefulness of the flesh. Details of this research have been published—Cott, 1946. *Proc. Zool. Soc. London*, pp. 371-524.

I am now proposing to extend this work to an investigation of the palatable and bio-chemical properties of the eggs of birds. Preliminary investigations on some 25 British species again reveal wide variation in edibility, and have led to other interesting results which justify further work in an attempt to examine correlations which may exist between relative palatability of the eggs of various species on the one hand, and such factors as vulnerability, nest-site, clutch-size, shell-coloration and feeding-habits on the other.

Through the kindness of the Director, facilities are now available for the carrying out of rating-tests at the Low Temperature Research Station, Cambridge, where there is available a panel of experts with a trained 'egg-palate', who can give consistently reliable assessments on edibility; the results will subsequently be checked and compared by feeding-experiments with rats, hedgehogs and other egg-eating mammals.

For this purpose I am anxious to obtain examples of as many species as possible for comparative treatment. Material from overseas would be especially welcome. Eggs of any species, however common, would make a valuable contribution towards this enquiry. Of larger birds, such as ducks, ibises, etc., one or two eggs per species would be sufficient. In the case of smaller birds, the equivalent of a complete clutch, or say five or six eggs, would be preferred.

Any eggs submitted should be:—

(*a*) taken fresh from the nest, before the onset of incubation.

(*b*) identified in the field: it is not always easy or possible to be certain of identification from the egg alone.

(*c*) securely packed: the eggs should be well-wrapped separately in rolls of cotton-wool so as to prevent their working through the wrappings and coming into contact with one another, and enclosed in a box or tin sufficiently strong to withstand crushing.

(*d*) despatched by air mail (unless it is possible to arrange facilities for cold storage on sea passage), addressed as below, and covered by a note 'Natural History Specimens of no Commercial Value'.

University Museum of Zoology, DR. HUGH B. COTT.
Downing Street,
CAMBRIDGE.
March 24, 1947.

[Giving further directions in a subsequent letter about the packing of eggs for transit by post, Dr. Cott writes—'Unblown eggs are most fragile and they do not stand up at all well to the knocks received in transit. The only safe way is to wrap each individual egg in *plenty* of soft cotton wool—about one inch in thickness all round is about right for small eggs—and to put outside the wool layer a wrapping of soft paper. This prevents the eggs from working their way through the wool wrapping and coming into contact with one another or with the sides of the box'. He suggests that, to start with, it would be as well to concentrate upon larger species, because it is doubtful whether Warbler-size eggs would stand up to the temperatures encountered during transit.—EDS.]

AN APPEAL TO BOTANISTS

I have been in correspondence with Sir William Wright Smith of Edinburgh. He is anxious for material of *Primula lacei* Hemsl St. Watt. This was found by J. H. Lace on 16 March 1888. Has it ever been found since? Localities are variously given as 'Quetta', 'Loralai' & 'Hamai', and 'Torkhan—alt. 4000′'

Have you any further information? It is yellow flowered and akin—apparently—to *P. floribunda* from which it differs in

(*a*) having farina on the leaves,
(*b*) lack of a flower-scape,
(*c*) length of coralla tube,
(*d*) the almost woody stem or rootstock.

It *may* be a form of *P. floribunda* or may even be a species of *Diapensia*. Anyhow more material is needed. Can you perhaps publish an appeal for material? There must be some members in the Zhob one would think. Material to be sent to you or me or direct to Edinburgh. Specimens of *P. floribunda* from Baluchistan (whence it is *not* recorded) and from Waziristan (where I have found it several times) are also wanted for comparison. The only actual locality for *P. floribunda* that I can give is on the wet cliff of the Baddar Toi just under (literally) Ladha Camp—1920. I should expect to find *P. lacei* if it grows at 4000 ft., in some similar place, i.e. where water oozes out of a cliff and where stunted maidenhair ferns occur commonly in those parts.

1718 T. U.
C/o Army P.O., DONALD LOWNDES,
Saharanpur, LT.-COL.
June 3, 1945.

MISCELLANEOUS NOTES

1.—A MAN-EATING TIGER OF THE NELLIAMPATHY HILLS.

(*With a photo*)

Man-eating tigers are not common in western parts of South India, and are almost unknown to occur in the forests and mountains of the Western Ghats south of the Palghat Gap.

For more than 70 years previous to 1946 there was only one known instance—a solitary killing which was not repeated. (*B.N.H.S. Journal*, vol xxxii, page 209).

In March 1946 a woman was killed on the Seetagundy Coffee Estate and entirely eaten, and on 9th April another woman worker was killed but not eaten. After a lapse of 8 months a man was killed on 10th December on a path near the Estate Hospital. The body was taken uphill among coffee bushes and not eaten. One ear was found on the pathway at place of seizure. This seemed quite abnormal and why it happened was realized when the man-eater was killed.

It may be, perhaps, that these two bodies were not eaten, although the animal had time in each case to have at least consumed some portion of them, because they were not dragged into dense lantana or other jungle but among more or less openly planted coffee bushes. The man could have been easily dragged into nearby dense evergreen forest. All these killings took place after midday or in early afternoon.

It was not until mid-January I was able to go to the Seetagundy Estate, over 300 miles south of Bangalore. On the 14th February a woman was killed soon after midday on an open hillside six miles away on the Chandramalai Estate which is within the Cochin State.

Arriving at the place about 4 o'clock I was about to enter the lantana thicket by the tunnel through which the body had been dragged when a man close behind—the estate watcher, nervously let off his gun a pace or so behind me. I should have had the foresight to shoo him away. Fortunately the weapon was not pointing at me, but unfortunately the report sent the tiger off with a frightened *whoof*, and a golden opportunity was gone. The tiger would probably, almost certainly, have faced the cannon's mouth (.470), for previous to my arrival several men had been peeping and peering, and with some success. 'The tiger is there, he has eaten her head', and so it was: he would have thought me to be but another and bolder peeper: the field glasses would have detected him and a bullet beneath the chin ended the business before he decided to come or go.

In all lantana thickets there are larger or smaller spaces bare of the growth and it was in a narrow one the body lay, feet towards me, a short twenty feet inside. The watching tiger had been lying close behind the shoulders in a very slight depression. The head had been munched off and part of left upper surface of body gnawed away. The skull photos show why such expressions used.

The lantana belt was fortunately not too broad at that place so an office chair machan was soon fixed in a not too distant many-branched tree at edge of the dense evergreen forest which lay behind. Meanwhile I secured the body by two wire ropes looped round slender waist and ankles, a heavy pole being passed through the lantana and loops at other ends and also tied to a distant sapling by a strong rope. Now the body could not be silently removed.

When the tiger returned after dark a near-fatal shot in the head anchored him close by until the morning when the arrival of a number of men roused him from his stupor to stagger to his feet and be put down by another bullet. Near where he had been lying was a mass of entrails vomited during the night, so he had evidently been scavenging near the estate slaughter house the previous night.

He was a very old animal. Limit of age in captivity appears to be 13 to 16 years. In a wild state tigers known to be twenty and having sound teeth have been killed. There seems no reason why such animals should not have lived for another five, or even ten years.

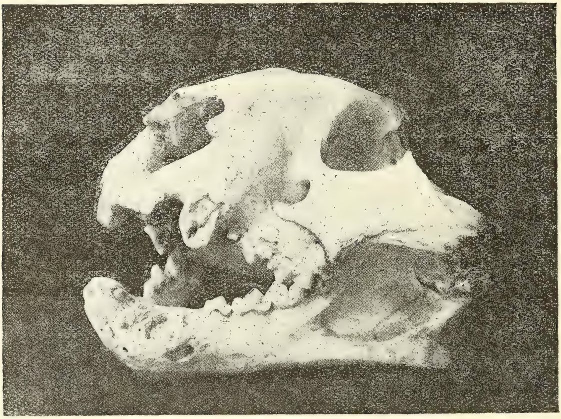
Except for the right upper carnassial (premolar) being decayed all the back teeth in upper and lower jaws are sound enough. The right lower canine is a mere stump and worn level with the front teeth, of which only four remain. The left lower canine is almost completely decayed away and part of the jaw on that side gone. It would seem that the lower front portion of the jaw never at any time properly and normally met the teeth of the upper jaw. The three canine stumps have large holes in their centres. The skull shows more than the usual signs of age, almost all the sutures being completely ossified.

Of all the teeth in the front portions of the jaws only two in the lower jaw function against the upper, and those not in proper position as the photograph shows.

It seems probable that both age and bad dentition led to his killing human beings, but his having been caught in a wire deer-snaring noose may have had something to do with it. Wounds caused by the wire were unhealed in places and contained maggots. The scar almost completely encircles the waist. How long may he have been in the noose without food and water? How long ago did it happen? and how did he get out of it? "He was a very clever animal, he used his hands" said one of the men.

The noosing may have been four to six months previous to the 15th February, and it is certain that somewhere in the Nelliampathies some of the workers on the estates have knowledge of it, for game-snaring nooses are visited for results and the animal would not have been less vocal than the 9 ft. 7 in. tiger caught in a noose in October 1927 which made 'Plenty big noise'. At that time two other tigers were killed in similar nooses. (Note by Mr. H. A. Boas in *B.N.H.S. Journal*, vol. xxxii, page 790).

This tiger weighed but 316 lbs, a good hundred short of normal for his 9 ft. 3 in. curves measurement. Chest 48 in., neck 27 in., waist 36 in. Owing to emaciation his paws looked enormous. The pad cushions were very hard with little fatty substance beneath them.



Skull of the Nelliampathy Maneater.

One can only conjecture why more people were not killed. Besides the four mentioned there was one other some distance to the east.

It was not for want of opportunity for at any time, all over the extensive tea and coffee estates which are interspersed with much dense cover, he could have easily secured two or three victims each week. So why an interval of 8 months between April and December, and another two months after that date?

Bangalore,
30th March 1947.

R. W. BURTON, Lieut.-Col.,
Indian Army (Retired).

2.—A TIGER 'RUNS AMOK'.

Christopher's query in the *Journal* (Vol. 46, No. 2) embraces many possibilities, but without details or facts, it is difficult to assign a reason or define the cause.

A young male tiger while courting will sometimes demonstrate to his spouse by killing 5 or 6 animals in a herd with no other intention but 'showing off'. What is done is probably done under the spur of sexual excitement during which these animals loosen all the accustomed restraints. I have experience of this on two occasions: once in the C.P. when five full grown cows were killed, but the tigers did not return to feed. This incident took place at 2 p.m. and I was on the ground and sitting up at 4.30. The second occasion was in Burma when seven full grown beasts were killed, and although the tigers were present in the vicinity, made evident by the courting noises throughout the night and part of the next day, they also failed to return to any of the kills.

It is a precautionary measure in many parts of India to follow up a wounded tiger in a crowd, this is certainly practiced by Tharus, Gonds, Baighas and Kachins using primitive weapons.

How 7 coolies came to be killed must be to large degree rank carelessness. A tigress with a nest of newly born cubs, or if cubs have been killed or robbed will often throw caution to the wind especially if fired at or cornered, but in every case gives due warning with growls and demonstration.

It is most unlike a maneater, or even an ordinary tiger. The myth lies in the seven foolish coolies.

H.Q., Bombay Area, A. ST. J. MACDONALD.
Bombay,
1st *February* 1947.

3.—THE RETURNING TIGRESS.

About 3 weeks ago I was informed that a donkey had been killed about a hundred yards from our bungalow by a tiger. The kill was in a hollow on the side of a deep ravine. As the trees were too high I made a small hide in some bushes about 30 feet from the 'kill' on the opposite side of the ravine.

The only rifle available at the time was missing its foresight and also my torch batteries were almost flat, and, as is usually the case in an emergency, the shops had no spare ones.

As my friend was unwell at the time I decided to sit up on my own. I was in my 'hide' by 5.30 and must have dozed off because at about 9.30 I was awakened by a sound of bones being eaten. I am afraid I was a bit clumsy with the torch and rifle, one in each hand, and the result was that I did not get a shot at the perfect picture of the tigress on her kill that I saw in the dim light. She jumped off and disappeared in the jungle.

I decided that as she had had such a fright the odds of her returning were very small, and so I went home. After I had had some supper I thought I would go down and have a look just in case she had returned. I was still about 20 feet from my hide when I heard a loud crack of bones again.

I aimed at the sound and put on the light and there was the tigress. I aimed as best I could and fired. The result was a loud cracking in the jungle and I thought I had secured a bull but I thought it wiser to get home.

The following morning we had a good search and found that I had missed and the tigress had returned to her kill and had dragged it about 10 feet and had eaten about three quarters of it. I then decided to sit up again for her as she might well return again. Thus the same evening I took up my position about 5 o'clock and waited. At about 8.30 I heard some footsteps *behind* me and then they went by to my right and paused in front of me in the ravine about ten feet away. I could hear the tigress breathing but could not see her because she was in the ravine. Presently after about ten minutes (it seemed much longer) I heard her drag her kill. I aimed at the noise and switched on and again I saw the tigress, and again I had a shot at her and by the noise there was afterwards I was certain of a hit.

Anyhow I came home. The following morning we had a search and found that I had missed her again and this time by a few inches as we found the bullet in a tree beside which she had been standing.

Then we discovered that she had returned again after I had fired at her and she had taken her kill another 30 feet and had eaten it all except for a few bits and pieces.

As there was nothing left to sit up over I decided to wait till she killed again. The following day a half eaten kill about 5 days old was found in a swamp near our factory. This was another donkey and it had been killed before the one that I sat up over.

About two weeks later we had news of a young bull which had been killed on a rocky bush covered hillside about 200 yards from the jungle and about ¾ mile from our bungalow. My friend had the first news and he set off at once but in this haste forgot the torch.

When I got home I found out about this and so I decided to take it out to him and to sit up with him.

We had previously decided that at the next kill it was his turn to shoot.

I shouted to him from the road which was about 200 yards below the kill, I did this to avoid being mistaken for the tiger in the failing light and shot in consequence.

When I reached him we took stock of the surroundings. The only place to sit was behind some low *Strobilanthes* bushes about 40 feet above the kill. The intervening space was fairly clear.

At about 6-30 we heard a sound which sounded like a sambhur belling though we were doubtful. After a few minutes we again heard the noise about 400 yards away and then we recognized it to be the tigress calling. After fifteen minutes or so we heard some monkeys making a lot of noise below the road and so we knew the tigress was going to come the way we expected her; so he trained the rifle on to the kill and I got ready with the torch.

You can imagine the fright we both got when the tigress suddenly let off a terrific cough about 20 feet away directly *behind* us. I very consciously looked round and I saw the tigress's head above the bushes and looking steadily at me and I was returning the stare wondering what I would do if she decided to spring down on us which she could easily have done. I nudged my friend and he had a look too but he withheld his fire as the bushes were in the way. The tigress then noisely came down the hill coughing all the time about ten feet away just the other side of the bushes through which we expected her to come at any moment. Then we presumed that she was going straight down to her kill. Suddenly we heard loud footsteps just in front of us. I nudged my friend and put on the light. As my friend aptly said afterwards a wall of stripes stood before us and uncomfortably close (we measured the distance afterwards and found it was barely 2 yards). My friend pointed the rifle at the tigress's shoulder and fired. The tigress leapt high into the air and cantered down the hill with her tail straight up in the air like a frightened calf, and plunged blindly into the bushes. We were both certain she had been hit as it would have been impossible to miss at that range. Then we both decided that tiger shooting from the ground wasn't such an attractive sport as it had seemed previously, and so we both slithered down the steep hillside and keeping a careful watch in front and behind we went home as fast as we could.

The following morning we made a search and my friend found the tigress dead about fifty yards from where she had been shot at.

She was a fine animal in wonderful condition and measured eight feet ten inches.

When I was skinning her I found that she had about 25 porcupine quills in both her fore feet and in her chest. The biggest piece was two inches long. One of them had turned septic and must have hurt her when she walked. This was probably the reason for her taking to killing donkeys and cattle.

I must state here that the probable reason for the tigress not being frightened when I fired at her twice before, is that she was probably used to hearing rock being blasted all day long and so didn't bother much. Her cub which had been seen with her is still at large and has already attempted to kill a cow.

HIGHWAYS ESTATE,
CUMBUM P.O., A. F. HUTTON.
MADURA DIST.
22nd March 1947.

4.—WEIGHT OF BULL BISON.

A few years ago I gave details of weights of a few Bison, Sambhur, Tiger, Panther and Bear shot in this area. (S. India). The heaviest Bison then recorded was one weighing 1,900 lbs., shot in February 1937. I have since weighed (piecemeal) the largest bull Bison I have ever seen shot, on the 4th of March 1947. This animal weighed 2,071 lbs; in other words 1 ton less 169 lbs.

HONNAMETTI ESTATE,
ATTIKAN P.O., R. C. MORRIS.
VIA. MYSORE, (S. INDIA).
7th March 1947.

Since writing the above I am able to add the following:—

Two bull Bison which were shot on the 15th and 17th March 1947, weighed as follows:—

1,297 lbs.	(Young bull).
2,049 ,,	(Old ,,).

R.C.M.

5.—NOTES ON THE BRUSH-TAILED PORCUPINE (*ATHERURA MACRURA* L.).

In May 1947 when in the outer ranges of the Naga Hills of Assam I saw in the house of a member of the Lhota Naga tribe four incomplete skulls of a rodent which I did not recognise as belonging to any species found in that area. I accordingly made enquiries as to their identity, and was given the following account of the animal:—

It is known as the *Tsetang*, and is described as being about the size of a hare, but more of the build of a porcupine, with a short tail, and ears 'shaped like a rat' but proportionately larger.

The *Tsetang* is essentially a forest dweller, and is found only in the flatter areas of the valleys and extreme foothills of the outer ranges of the Naga Hills. Nagas from the inner hills whom I questioned had never heard of it.

It lives in small colonies of six to eight (family parties?) in very long burrows, described as being 'too long to be worth the labour of digging out'. Although one area of forest may contain several such burrows they are said never to be close to one another.

I was taken to see a burrow at the foot of the hills. It was excavated in soft, sandy soil, and the entrance was about twenty-four inches across; but narrowed down considerably a short way in. Leading up to the entrance on each side was a well worn track with many footprints on it, some obviously quite fresh. They were those of a small-clawed animal, and although rather blurred I judged them to be about the size of a hare's. Not far away was a fallen, hollow tree, which had signs of occupation by some animal. I was told that it was used as a temporary shelter by the *Tsetangs*. The burrow was in thick rain-forest.

They are strictly nocturnal, and I was told that they never come out before dark, and are back in their burrows before daylight. By night the whole small colony roams together in search of food plants.

The note is said to be a chattering. They hibernate during the cold weather.

Within the small area I visited, the *Tsetang* is regarded as quite common, and not decreasing in numbers.

STONYLANDS HOTEL,
SHILLONG, ASSAM, C. R. STONOR.
15*th May* 1947.

[A skull of the rodent referred to in the note was sent to us by Mr. C. R. Stonor. It is that of a Brush-tailed Porcupine (*Atherura macrura* L.) EDS.]

6.—NATURAL DEATH OF ELEPHANTS.

Why 'natural'? The article under the above heading in the *Journal*, Vol. 46, No. 2, is of considerable interest.

The death of this elephant followed a severe injury received in a fight with another elephant. It would have been of value if the bones had been examined. It looks as if either the shoulder or the elbow had got broken. In spite of Game Laws, etc., it is hoped that a kind bullet finished the suffering. I have been told that in Sanctuaries, Natural Reserves, etc. such is *not* allowed but I assured the authorities that if I did come across a case of real suffering and had my rifle with me that I would use it.

In July 1943 we were filming wild life in the Yala Strict Natural Reserve on the south-east coast of Ceylon. We were camped on the banks of the Kumbukkan Oya, the large river which forms the eastern boundary of the Reserve. This river has got several small islands, which in the dry season, May—September, make splendid observation posts from where any kind of animal and bird can be seen and watched. As a rule a 'hide' is not needed which is a great advantage as it leaves one free in one's movements when wanting to follow up possible subjects with the heavy cameras.

The best time to start is 3 p.m. and for an hour or more G. and I had been watching several herds of deer, buffalo and some elephants as they came down to the river to drink from the small pools and streamlet left in the bed. Nearest to us were a cow elephant and two youngsters, one a fine little tusker.

At about 5 p.m. a lone bull came wandering out of the jungle just in front of us from the direction of the small family group. There was nothing remarkable about this animal but some feet of colour film can always be useful, especially with the sun on him against the lovely green foliage background. When he came closer it was noticed that the organ was fully extended and that this remained so all the time we watched him.

On coming towards us, several times wandering about and moving, nothing out of the ordinary was noticed. The elephant appeared to be in good condition, age about 20, height 8 feet 6 inch to 9 feet. We had ample time to study him, as had our men, both experienced trackers. It did strike us that he was somewhat restless which—rightly or wrongly—I put down to the vicinity of the cow. Time and again he seemed to look at her although she must have been some 100 yards away. Several times he sniffed at the water but we did not see him drink.

The light was getting poor, anyhow it was no use wasting precious colour film on so simple a subject. We must have watched him for half an hour or more and took a few stills. Suddenly he started to move and came straight towards the tripod and cameras. We were smoking on the island's bank. When within a few feet of the cameras—we were just going to save—he turned and slowly walked past us to our left. Little did we then realise that we had been filming and watching till it got rather boring—a dying elephant.

Some 20 yards away, just near the bank of the river, he stopped and stood leaning against a tree and while we were watching he suddenly 'slid' down against the tree trunk to lie on his left side. This very unusual behaviour made me realise that all could not be well. It was exactly like a drunken man clasping a lamppost and then sitting down on the pavement!

After some ten minutes and as we got near, too dark to photograph and heavy shade overhead—the elephant managed to struggle to its feet with considerable difficulty. For a while he stood looking very dazed and then very slowly wandered up the low riverbank into heavy jungle.

It was time to pack up and return to camp when—a sound like a deep and heavy moan, followed by a terrific crash just inside the jungle where the elephant had been seen to enter. We had no torches and it was too dark to follow.

Next morning the elephant lay dead, only eight or nine yards within the jungle. A deep fresh gash across the left cheek caused by a sharp broken sappling. How valuable a post mortem would have been. The dung was normal and fresh. It was not old age; while it is practically certain that this elephant did not die of any injury or an old shot wound. He fell miles away from any habitation or shooting ground. Of course this is no proof knowing how wounded elephants can and do travel for miles and even days but if he had been wounded it is difficult to believe that none of us four, with a fair knowledge of the jungle and elephants, would not have noticed it. Under the tree he was lying on his left side, he fell dead on his right side. The extended and somewhat swollen organ made us wonder if death perhaps was due to some sexual reason or damage.

The true reason will never be known, the strip of film is a sad souvenir. I am writing without my diaries but believe that this was the fourth or fifth wild elephant I have found dead where it was impossible to establish any kind of reason or proof unless an expert post mortem had been possible. I remember one small elephant—later on proved to have been shot at by field watchers a week or so before—lying dead in the centre of three jungle road junctions. As far as I could ascertain it had travelled a good ten miles to get here and meet the end. The wound in the neck, by a muzzle-loader from above, was a mass of inflammation and matter some six inches in diameter.

Twice I have come across dead elephants lying in a stream or river where it was impossible to make any investigations of any value. In both instances the dying animals had of course come to the water as their last hope.

The 'burial ground' idea, although romantic, is a myth as are so many of such ideas about the wilds. The wilds hold little romance where death is concerned.

Box 15, A. C. TUTEIN NOLTHENIUS,
COLOMBO, CEYLON, F.Z.S., A.C.L.
7th January 1947.

7.—THE PISCIVOROUS HABITS OF THE RORQUAL OR FIN WHALE (*BALAENOPTERA* SP.).[1]

Malabar fishermen affirm that schools of whales are commonly seen in the sea off the Malabar Coast. They come in pursuit of huge mackerel or sardine shoals. No effort is made to fish for them and these giants are seldom washed ashore. In fact there are only twelve recorded instances of whales having been stranded on this coast and these occurred within the past hundred years. Of these five were rorquals.

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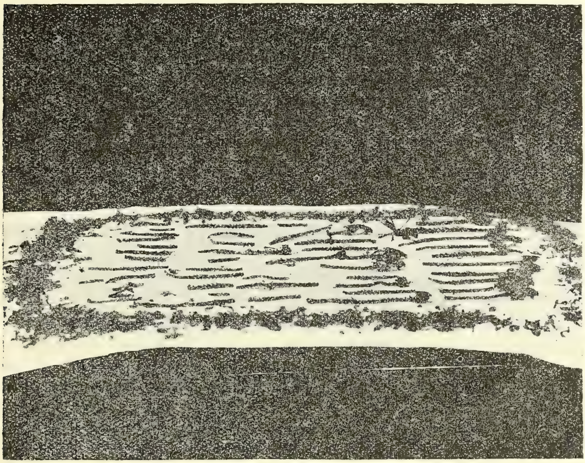
[1] Published with the kind permission of the Director of Industries and Commerce, Madras.—Authors.

Recently, on the morning of the 28th January 1947, a Rorqual measuring 45 feet in length and 20 feet in girth was stranded at Naduvattam three miles south of Calicut pier. It was in an advanced state of decomposition, having been dead a few days before it was washed ashore. Behind the middle of the body all the flesh and viscera had been removed—probably bitten off by ravenous sharks or removed by nearby villagers. The vertebral column was intact.



A few mackerel skeletons from the stomach of the stranded whale

The whale was pale black dorsally and ash coloured ventrally. Forty-two furrows could be counted on its ventral surface. The teeth were absent. The long thin bony plates characteristic of whalebone whales, called 'baleen plates' or 'whalebone' were very ill developed. One cannot be definite about this, as the mouth looked tampered with. The two nasal openings could be noted. The hand had four digits and all the other bones were intact. These characters are those of Fin Whales (*Balaenopteridae*).

Everything about this giant among the existing and extinct creatures, is interesting both from its huge dimensions and its rarity on this coast. Small wonder then that its malodorous carcass drew thousands of villagers who came to have a look at what they called *Kadalana* in Malayalam, meaning 'Sea elephant'. But the most surprising and interesting fact had still to be revealed. The opening of its large stomach exposed the remains of hundreds of mackerels (*Rastrelliger kanagurta*), which the whale had devoured (see photo). About 500 complete skeletons were picked out, not counting the half digested mass yet to be reckoned with. It is almost sure that this creature had devoured more than a thousand mackerel. The undigestable lenses of the eyes of these fishes looking like coriander seeds could be picked up by thousands. It must be remembered that it was possible to examine only one of the chambers of the stomach. So it can safely be presumed, that this comparatively small specimen had swallowed a huge shoal of mackerels.

About the food of whalebone whales under which the Rorqual falls, Professor Adam Sedgwick writes: 'the gigantic whalebone whale which are without teeth but possess whalebone on the palate, feed on small floating marine animals, nudibranchiates, molluscs and jelly fish etc.' Frank Evers Beddard states that the interesting fact that the whales feed among swarms of pelagic creatures, which they engulf within their huge mouths, led the ancients to believe and assert that they feed on water only.

In a recent *Discovery* Report (1942) Dr. Mackintosh has reported in detail, on the food of whalebone whales in the Antarctic and warmer waters. The examination of the stomachs of several hundreds of these whales has proved beyond all doubt, that the Antarctic whalebone whales, mainly feed on shoals of a shrimp-like crustacean, *Emphausia superba*, collectively known as 'Krill'. The only recorded instance of an Antarctic whale, taking to a more substantial diet than Krill, was the case of a Blue Whale, examined on the 8th January 1938 by Major Spencer, which had consumed fifty 'ice fish' 9 to 12 inches long. According to Dr. Mackintosh, these whales which feed very heavily in Antarctic on Krill, are found to starve during their northward migrations to temperate coastal waters.

Perhaps in tropical waters the whalebone whales feed largely on fish or more likely, when in pursuit of minute floating plankton (krill), shoals of fishes, which themselves subsist on these plankton, are engulfed unintentionally. But intentionally or not, these whales and their cousins the dolphins and the porpoises, no doubt follow shoals of food fishes in schools and play regular havoc among them.

Our thanks are due to Dr. S. T. Moses, Director of Fisheries, Baroda for his kind suggestions.

DEPARTMENT OF FISHERIES,
BARODA,
2nd April 1947.

P. K. JACOB.
M. DEVIDAS MENON.

8.—CURIOUS NESTING SITE OF THE MAGPIE ROBIN [*COPSYCHUS SAULARIS* (LINN.)]

With reference to Mr. Kingdon-Ward's note on the Magpie Robin in Vol. 46, No. 3 of the *Journal* it may be of interest to record that while I was posted at Dibrugarh in Assam in 1941 a pair of Magpie Robins nested in the back verandah of our bungalow there. This verandah was seldom used and at the most remote end was the electric light meter. This was enclosed in a fairly large wooden case attached to the wall. Originally there had been two meters in the box which was about 2 ft. 4 in. long and 14 inches wide by about 9 inches deep. The meters had been set on the wooden back of the case, one above the other; the upper one being intended for lights and the lower for power. Both meters had little glass covered spy holes opposite their dials. For some reason the lower meter had been removed and the glass in the spy-hole opposite it had been broken. One morning while having a look at the meter I noticed an old nest in the bottom of the box. I wondered what bird could have nested in this queer spot but without examining the nest very closely I removed it and threw it away. Later, about the middle of April I was surprised to see a Magpie Robin pop out of the box. I examined it and found a partially built nest. Later eggs were laid and incubation commenced. Then something went wrong and the eggs disappeared. Later—it must have been at the beginning of June—I discovered a new clutch of eggs in the nest. This time the brood was successfully reared.

The presence of the old nest would indicate that the same pair had bred there in 1940 also. The monthly inspection of the meter by the meter examiner and the slight hum from the instrument did not seem to worry the birds in the slightest.

Incidentally I have got a pair of Magpie Robins nesting in a nesting box on a tree about 15 yards from our front verandah here at the moment. Horse hair appears to be a favourite ingredient of the nest of this species.

HAFLONG, NORTH CACHAR HILLS, R. E. PARSONS, F.R.E.S.,
ASSAM, *Indian Police.*
21*st April* 1947.

9.—AN EARLY NEST OF THE TAILOR BIRD [*ORTHOTOMUS SUTORIUS* (PENNANT)]

'The breeding months' of the Indian Tailor Bird 'are principally May, June and July, but in many parts they breed both earlier and later' (Stuart Baker, *Fauna of British India Birds*, Volume II, pp. 411). Whistler makes the same statement almost in identical language (*Popular Handbook of Indian Birds*, 3rd edition, pp. 164). According to Sálim Ali, the nesting season ranges between April and September (*The Book of Indian Birds*, 1st edition, pp. 84). Earlier instances therefore may not be altogether unworthy of being recorded. Perched on a slender branch in a lemon bush I found yesterday (11th April) a fully fledged chick of the Tailor Bird which had obviously left the protection of its nest two or three days too early. The nest was not hard to find. It was built in a purse made of two leaves in the upper part of the bush; the bottom had given way probably owing to the scarcity of fibrous materials in it and the chick had perforce to leave. It was not incapable of using its wings or it would not have been able to find the comfortable perch it was occupying. The nest must have been built early in March outside the usual normal limits of the breeding season.

IMPERIAL RECORD DEPARTMENT,
NEW DELHI,
12*th April* 1947.

S. N. SEN,
Director of Archives,
Government of India.

10.—OCCURRENCE OF THE WAXWING [*BOMBYCILLA GARRULUS* (LINN.)] IN BALUCHISTAN

When I was coming back from the bazaar to the Staff College on the 1st March I heard an unfamiliar bird call, a loud *tsee* and got off my bicycle. I immediately saw a flock of upwards of twenty waxwings. This sounds a tall story considering the rarity of the bird in India but they were extremely tame and I had no difficulty in checking the black throat, the chestnut forehead and the yellow tips to the tail feather, and of course the crest. This was about half way between the Staff College and the bazaar in a group of fruit trees. I counted twenty, but judging from the calls there were many more. I was unable to obtain a specimen as I had no gun. One or other of the birds flew down frequently to the ground and then after a few moments back to its tree.

QUETTA.
4*th March* 1947.
STAFF COLLEGE,

T. J. PHILLIPS, Major,
9 *Gurkha Rifles.*

[Besides the specimen obtained by Meinertzhagen at Quetta in November—'One of a pair' (*vide* Ticehurst, 'Birds of British Baluchistan', *J. B.N.H.S.*, Vol, xxxi, p. 867 (1927)] we know no other record of its occurrence in Baluchistan. Rare and occasional stragglers have been recorded from Bannu and Kohat in the N.W.F.P. It is perhaps worth noting that the 1946-7 winter was an exceptionally severe and late one in Europe and North and Central Asia. The appearance within our limits of such vagrants as this bird and the swans recorded further on doubtless had to do with it.—EDS.]

11.—ARRIVAL DATES OF WAGTAILS IN UPPER ASSAM

For some years past I have been in the habit of recording in my Fishing Diary the dates on which the first wagtail has arrived in my compound towards the end of the rains.

In case these are of interest to ornithologists I now give them:

1941	25th.	September
1942	20th.	,,
1943	28th.	,,
1944	17th.	,,
1946	25th.	,,

I know little or nothing about birds but assume they cross the Himalayas into Tibet before the commencement of the rains returning again for the cold weather in Assam.

Perhaps somebody would be good enough to confirm this?

HOOGRIJAN, P.O.
UPPER ASSAM, F. WOOLEY SMITH
30th September 1946.

[It is uncertain what particular species of wagtail is referred to above. All the wagtails except one—Large Pied (*M. maderaspatensis*)—seen in India during the winter months are immigrants from the Himalayas or the country beyond them, to the north: Central Asia, Siberia, etc.

The punctuality with which wagtails arrive in autumn is remarkable, and frequently commented on by observers all over the country. A ringed individual of the Grey Wagtail (*Motacilla cinerea*) has been recorded making its first appearance of the season on a particular lawn on Pali Hill, Bombay Suburb, (scarcely larger than a badminton court) as follows:—

1941	ca.	Mid September.
1942		11th September.
1943	ca.	Mid September.
1944		12th September.
1945		11th September.
1946		21st September. (exceptionally prolonged Monsoon!)

The bird was ringed only in the 1942-43 season; its individuality in the previous season is merely presumed, but since then has been unmistakable. The Grey Wagtail breeds in Kashmir and the Himalayas, and beyond from the Ural Mountains to Kamschatka. The distance from Bombay to its nearest breeding grounds in Garhwal and Kumaon, in a straight line, is about 1000 miles. Travelling over thousands of square miles of country, and finding its way back to this particular few hundred square feet of lawn with such precision and punctuality seems a truly astonishing feat.—EDS.]

12.—ABNORMAL EGG CLUTCHES

On 12th June last year, I found a nest of Hodgson's Wagtail (*M. alboides*) with 10 eggs. This was in the middle of a clump of tamarisk on a shifting shingly island just below Pahalgam, Lidar Valley, Kashmir.

This clutch is unusual and though it is matched by 'clutches of 9 and 11 of *M. a. yarrellii*, possibly by two hens' (*Handbook of British Birds*, Vol. I, page 277), it is strange that the record clutches of 5 and 6 eggs of the Common Sandpiper were also found at Pahalgam by Buchanan in 1907 (*Nidification*, Vol. 4, page 410).

Within a foot of the wagtail's nest there was another of the Common Sandpiper with four eggs. As there are few suitable places around Pahalgam, it is quite likely that Buchanan found his nest on an island more or less in this very section of the river. In the same place, I saw two more normal Sandpiper clutches of four.

It is quite possible that my wagtail's nest as well as those of the Sandpiper recorded in *Nidification* contained eggs of more than one female. Would sudden rises in water level on such islands account for the destruction of newly built nests and therefore concentration on those that survived?

Messrs. Faiz & Co.,   HUMAYUN ABDULALI
75, Abdul Rehman Street, Bombay, 3.
Bombay,
12*th May*, 1947.

[Enquiry shows that the writer is not quite certain of his identification and the nest with 10 eggs *may* have been that of the Masked Wagtail (*M. a. personata*).—EDS.].

13.—NIGHTJARS ON ROADS

In the last issue of the *Journal*, Vol. 46, page 481, Stanford refers to the 'unexplained' habit of nightjars sitting on roads at night.

In the Vizagapatam District (*JBNHS* 45, p. 343) a young male of *C. macrourus albonotatus* was obtained dusting itself on the road, while in the Birds of Bombay (*JBNHS* 40, p. 173) we have recorded Dung Beetles (*Onthophaga* sp.) from the stomachs of *C. asiaticus*.

Motorists around Bombay have probably noticed that fewer nightjars are now met on our roads at night, than a few years ago. It is possible that the asphalting of roads, combined with the difficulty of seeing dung on a dark surface, may explain their apparent scarcity.

Messrs. Faiz & Co.,   HUMAYUN ABDULALI
75, Abdul Rehman Street, Bombay, 3.
Bombay, 10*th May* 1947.

[The asphalting of the roads has certainly reduced the number of nightjars previously to be met squatting on them after dark. But it is difficult to agree that the darker road surface has anything to do with the visibility of a bird of such completely crepuscular and nocturnal habits. Again the fact that dung beetles were found in the stomachs of nightjars shot on roads does not by itself suggest that they were collected from dung lying on the road. Neither, we feel is it so important for a nightjar to be able to see dung on a roadsurface for any beetles that may or may not be there. A nightjar hawks its prey in the air, and if the flying beetle is visible to it at dusk or in the dark it would seem to be all that the bird needs. The suggestion that nightjars settle on dusty roads to dust themselves seems more reasonable. And of course at the same time the road, being free from obstructions, may offer better facility for chasing beetles and other insects flying across the open space.—EDS.]

14.—OCCURRENCE OF THE SOUTHERN GREEN PIGEON [*CROCOPUS PHOENICOPTERUS CHLORIGASTER* (BLYTH)] IN CEYLON.

It is, I think, worth recording that on the 5th January 1947, I met with a flock of 30 to 40 (or possibly more) Southern Green Pigeons (*Crocopus phoenicopterus chlorigaster*) in the jungles near Bibile, in the Uva Province of Ceylon. I had gone down to these jungles to try and trace the Ceylon Jungle Bush-Quail (*Perdicula asiatica ceylonensis*) of which I was anxious to procure specimens.

Seeing some Green Pigeons in a species of Banyan tree (*Ficus arnottiana*) I shot one, and, much to my surprise and gratification, on going to pick it up, found that I had obtained a specimen of the Southern Green Pigeon. There were a number of these green pigeons about, in a scattered flock, sitting amongst the dense foliage of nearby trees. After some trouble, I shot another pigeon which proved to be a beautiful male Ceylon Orange-breasted Green Pigeon (*Dendrophassa bicincta leggei*). I then crossed the road and came upon a small Banyan tree with a large flock feeding in it. These proved to be more Southern Green Pigeons, one shot being a female. The remainder of the flock then split up into pairs and small parties and remained in the vicinity.

Bibile is at the foot of the south eastern aspect of the Central mountain cluster; the jungles of the area are extensive, dense and well supplied with Ficus trees in fruit, so it is just the type of country where one would expect to find green pigeons congregating.

The only other record of the occurrence of the Southern Green Pigeon, in Ceylon, is Legge's (page 723) who writes: 'It appears to inhabit (or visit, according to Layard) the extreme North of the island'; and there are two specimens of his collecting in the Poole Museum. He states that—'it is migratory, only appearing in the fruit season, and returning again to the coast of India'. Mr. Holdsworth procured it near Arippu on the north west coast so that it would *not* appear to be entirely confined to the extreme North.' Legge himself never met with it. The present record makes a considerable extension to the known range of this pigeon, which would appear to be a very irregular migrant to Ceylon, during the North East Monsoon; it does *not* appear to have been seen in Ceylon since Legge's day—i.e. for over 60 years.

The whistle of the Southern Green Pigeon is very similiar to the call of the Orange-breasted Green Pigeon, but is louder and pitched in a rather lower key; also when it suddenly flies out from a tree it makes a louder clatter with rather hollow note. It is an adept at clattering out suddenly from the side opposite to that on which the sportsman is approaching, and giving no chance of a shot.

From Stuart Baker's description, it would appear that the two specimens I obtained are typical Southern Green Pigeons. I am, however, sending them to the South Kensington Museum for confirmation.

GALAPITAKANDE ESTATE,
NAMUNUKULA, W. W. A. PHILLIPS
CEYLON,
10*th January* 1947.

15. THE PERSIAN NAME FOR THE FLAMINGO

With reference to the note on Flamingoes from Babar's Memoirs in a recent issue of this journal (Vol. 46, pp. 545-7), it may interest your readers to know that the Persian name for the Flamingo is "Pákhlàn" (cf. Babar's "Baghlan Káz").

Therefore I cannot think that Pákhlán, as above transliterated, has necessarily any connection with Baghlan, the town in N. Afghanistan.

'Southwood' HAMID A. ALI
Mussooree, *I.C.S.* (retd.)
25th May 1947.

16.—FLAMINGOES IN KUTCH—A COMMENT

Mr. Sálim Ali's interesting article, 'More about the Flamingo [*Phoenicopterus ruber roseus* (Pallas)] in Kutch' gives us quite a number of interesting details about Flamingo life. However, I feel some of his references to my observations call for comment. But first of all I must confess that through oversight I omitted to give the period of my visit to the Great Rann.[1] It was between the 26th September and the 20th October 1935. Having made good the omission, I must now pass on in 'self-defence'.

After recording that both Dr. Ticehurst in Sind, and myself in the Great Rann, found seeds of aquatic and lacustrine plants in the stomachs, Mr. Ali remarks: 'There is so far no justification, however, for supposing that these constitute the only or indeed the staple diet of flamingo in these parts. It seems difficult to conceive that sufficient quantities of such seeds, e.g. *Ruppia*, could be washed down by rivers flowing into the Rann from the north-east to sustain a population of this magnitude for so long a period.' In the first place I differentiated between the stomach contents of young flightless birds, and adults capable of flight, for the simple reason that the feeding activities of the young were restricted to the Rann whereas the adults could go further afield. Accordingly, I stated that the stomachs of the chicks '*contained nothing except a collection of small black seeds*' which I subsequently identified as those of *Ruppia*. For the adults shot in the Rann, besides *Ruppia*, I added the seeds of *Scirpus maritima*, and the portions of *Najas* and *Chara*. The inclusion of the others indicated that the adults had been feeding outside the Rann.

From Mr. Ali's account it is evident that he did not examine the stomach contents of any birds obtained in the Rann, but refers to the stomach contents of two adult birds shot in the salt pans at Kandla, a long way from the Rann. He records the stomach contents of these two birds as follows: (excluding the sand) 'a small quantity of greenish vegetable matter like the "scum" from the bottom of the salt pans, and a large number (over 50 in each case) of red thread-like "worms" *ca* 10 mm. long, later identified as *Chironomus* larvae.' *Chironomus* is a small gnat (*Diptera*) some species of which are tolerant of salt water and live in the mud. It is unfortunate that Mr. Ali did not examine the stomach contents of birds shot in the Rann, both young and old, in which case he could have either discredited my statement or supported it.

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[1] Jour., *B.N.H.S.*, Vol. 41, p. 12.

Another difficulty that presented itself to Mr. Ali is that *Ruppia* seeds could support such a population in the Great Rann. *Ruppia* is a most prolific plant and it produces an incredibly large quantity of seeds, and accordingly I see nó great difficulty when taking into consideration such a large expanse of water during the periods when the Rann is inundated. *Ruppia* is a brackish water plant and commences life at the break of the monsoon when salinity is low, but no sooner salinity rises it dies off leaving an abundance of seed in the sand. *Ruppia* flourishes in still or gently moving water, but cannot withstand high currents. (For further information on *Ruppia* see my article published in Vol. 45, p. 396.) At the time of my visit the water was a 'mother liquor' for crystals were already forming at the bottom and under such conditions *Ruppia* cannot survive. As already stated in my article I could find no animal or plant life in the water, nor in the mud. The stomach contents of the chicks contained besides the usual compliment of sand '*only* the seeds of *Ruppia*'.

Turning from the question of food to migration and movements during the breeding season, in my article I put forward the suggestion that possibly when the winter rains failed in Spain flamingoes migrated to India, the Rann, to breed. This suggestion arose out of such records as were available to me and I merely attempted to draw certain conclusion from such records which offered a plausible explanation, which Mr. Ali referred to as 'a process of jig-saw-puzzle working in'! It is from such jig-saw-puzzles of Nature that we are finally able to form a complete picture! To this method of deduction Mr. Ali evidently takes objection for he writes—'His suggestion was that if unfavourable natural conditions were encountered in Spain the birds turned about and made for Kutch. The normal breeding season in the Great Rann being September to October, they would get ample time to do the return journey in. Then if they meet with the required conditions here (Kutch), they undertake breeding. Thus the marismas of Spain and the Great Rann of Kutch would, according to him (McCann), be the erratically used alternative breeding grounds of our Indian flamingoes. Personally I did not at the time, nor do I now, find Mr. McCann's 'supposition' a convincing one, but of course it does not do to be too dogmatic in such matters, and more data are needed. Mr. McCann pertinently observes that to obtain any proof the wholesale ringing of birds in the two areas (Spain and Kutch) would be necessary.' The chief objection to Mr. Ali's remarks lies in the fact that he suggested that I used the expression *Indian Flamingoes* whereas I merely referred to the flamingoes that failed to breed in Spain, and asked the question, 'do Spanish birds breed there (the Great Rann) in years when they cannot breed in the Spanish area?' and with due reserve added: 'of course, this is a mere supposition and further proof is required.' I gave them no *Indian* status! Accordingly the sentence 'Indian' birds 'turned about and made for Kutch?' did not flow from *my* pen but is a picture from his own brush! However, it will be an interesting point to establish whether the flamingoes are 'Indian' or 'Spanish' or a hybrid of the two! This can only be discovered by wholesale ringing in both breeding grounds.

BOMBAY NATURAL HISTORY SOCIETY, C. McCANN
BOMBAY,
17*th February* 1947.

[Dr. Erwin Stresemann, the celebrated German ornithologist, in a recent letter to Mr. Sálim Ali, commenting quite independently on more or less the very points raised by Mr. McCann, writes:

'. . . I think it would be worth while to make a thorough quantitative and qualitative research on the plankton of the Rann. At other places the little crustacean *Artemia sacua* has been found to be the chief food of the flamingo, and I would be surprised if this was not so in Kutch. These creatures are probably very quickly dissolved in the stomach by digestion, leaving unaffected seeds and such like obstinate matter only; an examination of the stomach contents, therefore, is often quite misleading if this circumstance is not taken into consideration. Some hydrobiologist should be consulted. Nothing definite is known, as far as I know, about the migratory movements of the Flamingo, and it would be most important therefore to continue the ringing of juveniles in spite of its being such a slippery business! I often wondered where the many hundreds of Flamingoes came from which in various years try to propagate at the mouth of the Rhone river in Southern France and almost always fail to do so owing to egg-loving humans. No one seems to know at present whether the former colonies in Southern Spain still exist or not; they cannot possibly be very large. There is no recent record of breeding colonies in Tunisia in spite of so many planes having inspected the Schott region during the war. In some years huge numbers breed at Lake Nekuru in Kenya and possibly at other East African lakes. The migratory movements of the Flamingo therefore seem to cover a very vast area, and I would not be surprised at all if there should be proved an exchange between Asiatic, European and East African colonies. In Asia, colonies are known from the Caspian Sea and other places in the interior. It would be a good thing to do a map of all the breeding colonies known to exist at the present time; but in the question of intercolonial exchange only the marking of quantities of young birds will be really able to help. Couldn't you find somebody to focus his interest and efforts on this task?'—EDS.]

17.—ALPHERAKY'S SWAN (*CYGNUS BEWICKII JANKOWSKII* ALPH.) IN KUTCH

On 9 April 1947 M. K. S. Madansinhji, Yuvraj of Kutch, brought down by air from Bhūj a live specimen with a fractured leg caught on Hamīrsar tank, within the limits of that city, on the previous day. The bird was one of a pair reported to have frequented this tank since 4 or 5 days before. It was said to have been attacked and disabled by a small crocodile, and was picked up fluttering on the shore. Its companion disappeared and was not seen thereafter. The bird lived in the Bombay Zoo (Victoria Gardens) till 14 April but succumbed to its injury. In the post-mortem by the vet the sexing was unfortunately overlooked, but the skin has been added to the collection of the Bombay Natural History Society. The following measurements were taken by me in the flesh: Wing 552, Bill (from forehead feathers) 99, Tarsus 112, middle toe with claw 140, Tail 161 mm. They suggest that it belongs to the East-Siberian race *jankowskii* (better known to Indian ornithologists as *Cygnus minor* Keyserling & Blas.) of which, as far as I know, there is only one other authenticated record from India: 2.1.1911 Tubi, Campbellpur, North-West Frontier Province, shot by a Mr. Hornsby. This skin is also in the Society's collection.

In all there are 3 records of the typical race, *Cygnus b. bewickii*—Bewick's Swan—from within Indian limits: (1) 2.12.1907 Jacobabad, Sind (*Jour., Bom. Nat. Hist. Soc.*, xxiii, p. 456), (2) 30.12.1910 Mardan, N-W.F.P. (*ibid*, xxi, p. 273) and (3) 17.12.1913 Khushdil Khan near Quetta (*ibid*, xxiii, p. 159). The Whooper Swan (*Cygnus cygnus*) has occurred thrice, while of the Mute Swan (*Cygnus olor*) 14 examples were recorded in India up till the end of 1915, from Sind, Punjab, N.-W. Frontier Province and the Baluchi Frontier. (For particulars see 'A Review of the Indian Swans', E. C. Stuart Baker, *J.B.N.H.S.*, xxiii, p. 457) In addition to these I personally know of one more example shot in Sind (? Sakrand) by my brother Hamid A. Ali on 19 February 1913.

Curiously enough this now is the first swan to be reported from within our limits since 1915, i.e. in 32 years. The occurrence of a swan in India is in itself a noteworthy event; its coming as far south as Bhūj (lat. 23° 15 ft. N) is unique. A point of particular interest in connection with the present record is that in the year 1870 or thereabouts Stoliczka claimed (*J.A.S.B.*, xli, 1872) to have seen some swans while crossing the Rann from Kutch to Pachham. On this Hume later remarked (*Stray Feathers*, iv, 33, 1876): 'I take this opportunity of noticing that the Swans which Stoliczka (who was very short-sighted) thought he saw on the Rann between Cutch and Pachham were pretty certainly *Pelicanus crispus* (Dalmatian Pelican) which I have seen from this very locality, and which I saw on the Sind coast and on the western coast of Kattiawar'.

And Hume probably *was* right; but here comes living proof of a swan in Kutch!

33 Pali Hill Bandra, SALIM ALI
Bombay 20,
30th April 1947.

18.—PERIODIC ABUNDANCE OF BAR-HEADED GOOSE [*ANSER INDICUS* (LATHAM)] ON CHILKA LAKES

In your editorial comments on Mr. Rahimullah's letter on the occurrence of a Bar-headed Goose near Hyderabad City, you remark that this bird was reported by Hume to be extremely common on the Chilka Lakes in the eighties and that small numbers are still said to visit the place in winter. They were extremely plentiful last winter and in 1945-46 on the Chilka Lakes. My party shot 7 in 2 days and had opportunities of watching large numbers at close range through field glasses. I saw also a report in the *Statesman* of the occurrence of the Egyptian goose at the same place this winter but was not lucky enough to see the bird.

Calcutta, E. C. BENTHALL
13th May 1947.

19.—SUSHKIN'S GOOSE (*ANSER NEGLECTUS* SUSHKIN) IN ASSAM

As advised by C. Gimson, Esq., Political Agent, Manipur, I am sending you a goose skin for identification. This goose was shot by me in Manipur in December 1946. It was in the company of a large skein of Greylags.

It is of interest as so far the only geese in Manipur have been Greylag and Bar-head. One Dwarf Goose only has been recorded in past years, and no Whitefront.

Imphal, J. HURRELL
Manipur State, *Lt.-Col.*
Assam,
10th January 1947.

[The skin is of Sushkin's Goose (*Anser neglectus* Sushkin), apparently a rare and occasional visitor to Assam, whose breeding grounds still remain undiscovered. The specimen (sex ?) measures: Wing 465, Bill 63, Tars. 80, Tail 136.—EDS.]

20.—THE LANGUAGE OF BIRDS

Early on a fine February morning in 1946 my wife and I were lucky enough to have Arundel Park to ourselves and there witnessed an episode of bird-behaviour worthy of record. Many birds are known to adopt a 'territory' which they seem to regard as theirs and defend from intruders of the same species, although quite indifferent to the presence of any other forms of life within it. The intruders likewise seem to recognise the bounds of this territory and to suffer, as it were, from a 'guilty conscience' when invading it, so much so that when challenged by the owners, they never put up a fight but allow themselves to be shoo-ed gently off. The great bird-observer, Kirkman, has shown that this patch of 'private property' extends for a foot or two round each nest of the Black-headed Gull, even in closely packed colonies, its edge being apparently plain enough both to owner and non-owner, though invisible to us. Edgar Chance has demonstrated that the cuckoo takes possession of, or at least established dominance over, a much larger area, extending for many acres. It was therefore with much interest that we saw two swans, evidently a mated pair, methodically clear the end of the lake containing their nest, which—looking down—we could clearly see situated upon a small island therein, from three swans whom they not only drove for some distance down the length of the narrow lake, but who finally took to the air and flew away altogether; but not before the following very illuminating incident had taken place.

All we noticed at first was a sun-lit stretch of water picturesquely set between wooded banks and enlivened by swans, moorhens, and a variety of ducks, some of whom still slumbered on one foot by the water's edge, as though not only humans could be afflicted by a hang-over. As we mounted the path to the right an unwonted flapping broke out and we saw two swans with out-stretched neck take to the air and alight again further down the lake. In a few moments they were joined by a third, whose departure was plainly being hastened by another. At this point we began to take notice and counted five swans altogether—two in the 'home' end of the lake that we had just left and three now swimming in the water beyond and below us. Swans in flight had made us interested, since one seldom has the chance to see them from above. The stretched necks and tense effortful, almost frightened sound, either from wing or throat, that accompanied each beat of the wing, were unfamiliar to us, and both this peculiar sound in flight and the prodigious length of the skid, made by the thrust-out feet on alighting, attracted our attention. Standing still, now, we saw swan *A* and *B*, the home-birds—shall we call them?—by no means satisfied with the clearance, swimming in a dignified but purposive fashion towards the three culprits (as we later decided they must be). There was something inexorable about this concerted attack, for it was delivered (as though by collusion) in such a way that the width of the lake was strategically portioned out, leaving as little room as possible for either to be by-passed. I was reminded of two tennis players rushing to the net. Each bird, of course, adopted the 'fighting-display', head curved down and back, wings up-arched, and propelled itself in jerks, both feet presumably thrusting in unison.

Birds, *C*, *D* and *E*, appeared to take no notice, till striking distance was reached, when birds *A* and *B*, each selecting one of them, began a real flapping, skimming the water with outstretched neck in the movement that, if speeded up, would end in flight. The attacked birds, meanwhile, made no show of resistance, but scuttled rapidly away and finally took to the air. That is to say, the attacked two departed, but bird *E* remained, now to the rear of *A* and *B*.

The flying pair, *C* and *D*, went off down the lake but, still within sight, wheeled and came back at a higher level, as though their real objective lay in distant waters, far behind the 'home' and to our left as we turned to face it. Wheeling still more sharply they passed from view behind the shoulder of hill on which we stood, and our attention returned to the lake. Here, birds *A* and *B* had turned in the water and were presently behind bird *E*; that is to say on the home side of him. This manœuvre would evidently enable him also to be ejected. But, before hostilities could begin, back flew birds *C* and *D*, passed above the trio, wheeled and came down nearer to bird *E* than to *A* and *B*.

Was the whole performance to begin again? Birds *A* and *B* set to work, quietly efficient as before. No fluster, no bluff; just a dispassionate firmness; something like policemen about to check a Car Licence. But this time, no warnings were needed; all three birds, *C*, *D* and *E*, began a hasty flapping flight down the lake, which merged gently into a slow rise above the surface; then, with gaining height and a wheel round and up, passed us on eye-level, and away into the landscape where they finally disappeared. This flight was just the same in direction as that of *C* and *D* before. Evidently, all three were now going to the original objective, perhaps returning to the water from which they had come.

Although we remained in the park for another half-hour they did not re-appear, and we saw swans *A* and *B* back on their island, tending the nest.

Now, all this may seem exceedingly trivial and ordinary, yet it contains elements of deep interest. Apart from the obvious collaboration of swans *A* and *B*, which seems to indicate some mutual understanding and unity of aim, besides a power of foresight disclosed by the strategic positions taken, there is in the behaviour of swans *C* and *D* something even more striking, namely their return to a danger from which they had escaped. Why this return? Having gone off again, this time accompanied by swan *E*, they do not return. It seems hard not to suppose that they came back to fetch him. If that were so, it follows that they regarded him as one of their party, noticed his absence, remembered where he was and reflected that he might fail to follow!

At that distance, it was hard to be sure, but judging from his size he might easily have been a last year's youngster just turned white. Cygnets remain attached to their parents for some time, and although one seldom sees two broods, one gray and the other white, one often sees clusters of adult swans showing no animosity among themselves, who may easily be of common parentage and not yet paired; for life-long batchelors and spinsters among swans are known to all park-keepers experienced in their ways.

The assumption of kinship presents, at any rate, the simplest theory, and if kinship were absent it only makes more impressive an act of obvious camaraderie, almost of 'rescue'. But the question I ask myself is, how these combined operations are organised? Which mind decides, leads or directs, and how does the other know its part? Given the ordinary human tendency to read ourselves into the animals, it would seem for all the world as though the returning two had brought courage to their fellow, or even said to him, 'Now, come along old chap, this way; make an effort!' and that thus exhorted he dared and did. But which of the two parents first noticed the absence of 'our Bertram', and when and how did the other come to share this misgiving?

22nd April 1947. CLAUDE A. CLAREMONT

21.—SOME FURTHER SUGGESTIONS FOR FIELD ORNITHOLOGISTS IN POST-WAR BURMA

In the *Journal* for December 1946, under the above heading, Lt.-Col. J. K. Stanford has directed attention to some of the more glaring gaps in our knowledge of the status and habits of Burma birds. The list of queries could be expanded almost indefinitely, especially if one were to include the mountain birds, and also problems connected with the geographical distribution of subspecies; but there are just one or two that have been in our minds for some time, which I would like to add to the list.

Sitta formosa. Beautiful Nuthatch

This is a very lovely and quite unmistakeable bird, yet records of it from Burma are very few. In early December 1938 I climbed a 5,000 ft. hill in the Arakan Yomas on the border of the Thayetmyo and Minbu districts, and saw several of these birds in the evergreen forest along the top, and collected one specimen; yet there is no record of this bird from Mt. Victoria, which is not so very far away to the north and which has been intensively worked, nor elsewhere from Arakan; Gen. Christison's paper (*Journal*, April 1946) does not mention it.

In early December 1944 I saw a solitary bird at about 6,000 ft. near the junction of the 'Nmai Hka' with its east bank tributary the Mekh Rame, in far Northern Burma. The only other records known to me are one from the Kachin hills and one from Kengtung.

Surely it must occur at some intermediate places between these widely scattered points?

Cisticola exilis. Siamese Golden-headed Fantail Warbler

Oates found this species in the Pegu plain, near Myitkyo and the Pegu-Sittang canal. There is no subsequent record. In July 1941 we searched the places where Oates found it, but without success. Has it been driven away by the development of the wide grassy plains of Oates's day into paddy fields?

Pyctorhis altirostris. Jerdon's Babbler.

This bird, which was widely distributed in the Irrawaddy-Sittang Plain in Oates's day, is now (so far as we know) confined to a small grassy swamp north of Myitkyo at the entrance to the Pegu canal, where we found it in July 1941. Does it occur elsewhere, or is it also on the point of vanishing from Lower Burma?

Batrachostomus. Frogmouths.

Nothing whatever is known about the voice and habits of these mysterious birds in this country. The few records are widely dispersed—Myitkyina district (where I picked up a dead bird in hills west of Mohnyin), Mt. Victoria, Southern Shan States, Karenni, and the Thaungyin valley.

If this species is strictly nocturnal we shall not make much progress with it until somebody records its call-notes.

With regard to Part II of Lt.-Col. Stanford's note, what we want is a list of species not described in 'Birds of Burma' that might reasonably be expected to occur in this country. If there are any species new to science still to be discovered I do not think they would exceed one or two in number, and the remainder of the 50 (or so) species that Messrs. Kingdon Ward and Stanford are inclined to wager they could find in Northern Burma can only be species that have been recorded elsewhere, e.g. India, South-East Tibet, Yunnan, Thailand, Malaya. So far as Indian birds are concerned I described, in square brackets, all those given in the Fauna of British India volumes that I thought might be found in Burma, but I could not do the same for Tibet etc. having no literature on the avifauna of those countries. (One of these square-bracket birds, the Long-billed Wren-Babbler, *Rimator malacoptilus*, I saw near the Taron-Tamai junction in Feb. 1945). It is clear from Lt.-Col. Stanford's note that most of the species he has in mind are those recorded by Forest in Yunnan; if he would be kind enough to send me a list, with brief field descriptions, of the 'probables' I would be only too pleased to include them in a revised edition of 'Birds of Burma' when it is possible to produce one; since the object of the book is to describe all species that might be met with in Burma. One cannot cover *every* possibility—unexpected finds like *Pyrotrogon wardi* and *Luscinia obscura* will no doubt continue to be made—but one can increase the odds against finding undescribed birds.

In conclusion I can endorse the remark about the remarkable way in which even a noisy or conspicuous species can be overlooked. The Himalayan Cuckoo (*Cuculus optatus*) has a distinctive call-note, and is one of the noisiest birds in Sinlumkaba, Bhamo district, in March and April; yet there seems to be only one record of this species from Burma—from Maymyo—and some doubtful records from the Chin hills.

MANDALAY, B. E. SMYTHIES
10th May 1947.

22.—'SHAMMING DEATH'—SNAKES

Dunbar Brander's letter in Vol. 46, No. 2, inviting further observation on animals shamming death opens up an interesting subject.

I have always kept a mongoose as a pet in the house, and had a dozen or more over a period of 30 years. With these I staged fights with snakes especially cobras. The cobra in fact is the only snake that would put up a fight to the finish. The others kraits, wolf-snakes, and water snakes will either curl up or bury their heads in the coils and resign themselves to death.

The Chequered Watersnake (*N. p. iscator*) in particular will 'sham death'. I have had them do so on several occasions. Specimens from four feet or more to eighteen inches. I will go further and say that for proof of this one need only get one of these snakes and allow a mongoose to worry it and a perfect 'shamming' will follow.

This is done by the snake sometimes standing up and striking at the mongoose three or four times after which it sinks to the ground and in slow motion turns over on to its back maintaining a slow muscular movement similar to a snake with its head beaten in.

The mongoose as often as not will leave the snake without biting or harming it in any way. When danger seems past the snake makes a hasty retreat only to repeat the 'shamming' when the mongoose arrives.

This is no exception but the rule with this species and need only be tried out for proof.

H.Q., Bombay Area,
Bombay,
29th February 1947

A. St. J. MACDONALD

23.—AN UNCOMMON HABIT OBSERVED IN THE FROG *RANA ERYTHRÆA* SCHLEG.

The curious habit of leaping over the surface of the water which is so typical of the Water Skipper, *Rana cyanophlyctis*. Schneid is well-known to be very uncommon amongst Indian frogs generally. This habit has also been attributed to the Indian Bull-Frog, *Rana tigrina* Daud. but has not yet been authenticated, as far as I am aware. Furthermore, even if the species is able to, it certainly does so very seldom. Boulenger (1890), Fauna of British India, states of *R. tigrina*, 'It is essentially aquatic, and is said, when frightened, to jump over the surface of the water much in the same way as on land.' W. S. Berridge in 'All About Reptiles and Batrachians (1935)' also states, 'When endeavouring to escape capture it has the curious habit of leaping over the surface of water just as if it were upon land.' With reference to this habit in two other species, C. McCann (1932), 'Notes on Indian Batrachians', *Journal of the B.N.H.S.*, Vol. xxxvi, No. 1, speaking of the habit in *R. cyanophlyctis* states, 'I know of no other frog that is capable of performing this feat, though it has been attributed to *R. limnocharis* and *R. hexadactyla*. Annandale[1] has rightly pointed out that *R. limnocharis* is quite incapable of performing this feat and that *R. hexadactyla* does so quite feebly on account of its large size.'

As regards my own observations of Indian frogs, I can assert, without any measure of doubt, that *Rana erythraea* frequently leaps over the surface of the water when alarmed. At Mymensingh, Bengal, in July 1944, I observed this species and made the following recording in my note-book:—'These batrachians were found in quite large numbers round the borders of some small ponds, chiefly amongst the vegetation. On being disturbed, they either swim away from the edge, or, more frequently, they jump away over the surface of the water in a manner akin to the habit of *Rana cyanophlyctis*. They are, however, very much lighter on the surface than *R. cyanophlyctis*, and appear to use this habit as much, or even more.' In the case of *cyanophlyctis*, the movement may be described as a 'skip' or 'shuffle' over the surface, but *erythraea* moves by a series of distinct jumps.

I suspect that *R. limnocharis* also sometimes practises this habit, though less frequently, and more after the manner of *R. cyanophlyctis*. My evidence on this point is, unfortunately, not quite conclusive.

96, Mortlake Road,
Kew, Surrey, J. D. ROMER, F.Z.S.
England,
25th *February* 1947.

24.—MATING AND THE PARENTAL INSTINCT OF THE MARSH CROCODILE (*C. PALUSTRIS* LESSON)

There is practically no scientific data on how Crocodiles mate, and I think, few people have seen crocodiles in the act of mating. It was not until recently this year that I could safely say that I had seen it. It was on the 19th March that my brother K. S. Nirmalkumarsinhji and I motored to the Shetrunji River. Here, at one of the deep 'Dharas' (deep pools) we saw two crocodiles swimming on the surface of the water, heading to meet each other. Then as they reached one another, one of them made a swirl as it turned round and dived. It reappeared some distance away and then followed the other until the leading crocodile dived. I have witnessed such behaviour time and again and since this was at the height of the mating season it was no surprise to me.

Then we drove to another 'Dhara' where we had news of two large crocodiles, and on arriving there, we waited for an hour without seeing anything. After lunch taking up my field-glasses I noticed a crocodile with head and tail out. I passed the glasses to my brother to have a look, remarking at the same time that one had already appeared. Looking in he said there were two and mating, and handed back the glasses. And there they were, head, neck and shoulders, one posed over the other, clearly visible. They ducked and reappeared two or three times in the same position, and I saw a lateral movement after which they separated. The crocodiles had definitely mated. The time taken must be about two to three minutes and it was then exactly 1-30 p.m. After separation both crocodiles submerged and surfaced at odd intervals until at 2-45 p.m. I saw them mating again. This time one crocodile surfaced and had its tail tip out. Then after 10 minutes it moved towards a sand bar where the water was about knee deep. I expected it to emerge but no; it remained stationery for at least another five minutes. Then the other crocodile surfaced and seeing its mate, immediately swam towards it. As it came closer to its partner, I distinctly saw it with closed mouth raise its head and neck high out of water, pointing its snout at an angle of about 70 degrees, for a few seconds. Then as the two met, I saw the male trying to mount and the female circling until the male actually mounted, gripping the female firmly. They were now in fairly deep water and I could only see their bobbing heads in and out of the water. At times only the female's snout was visible at others completely disappearing, reminiscent of duck (female) in mating. However, the male never attempted to grip the female with its jaws and when head and entire neck of both were visible, the angle was approximately the same. This lasted three minutes after which they completely submerged. The next I saw them they were about 60 feet apart. How long the two copulated under water I cannot say but they were submerged for at least five minutes. Nevertheless, what little I had seen of the mating of these reptiles was indeed a rarity. It is evident from this experience that mating may take place in water or perhaps on land by night, though I do not see how that would be possible. Judging from the heads, the two crocodiles were approximately the same size and between 7 and 8 feet in length. The males are on the average much slimmer than the females at this time of the year and I agree with Mr. McCann that fertilization must take place at quite an advanced stage when the ova are well developed. He had also surmised that mating takes place in water, as I had always believed, but lacked sufficient proof on the matter.

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[1] Rec. Ind, Mus., Vol. XV, p. 122 (Bombay Streams Fauna).

Parental Instinct

The question is: Does the Crocodile take any parental interest? My answer is Yes—but only to a certain limit and when conditions necessitate it. Here I may make it clear that conditions for parental care may not arise at all: such as when the river is in flood or when the young have easy access to water without exposure to danger. From my experience, the parental instinct is aroused at the time of the eggs hatching, and lasts until the young crocodiles reach safety and are at home in the water. I have seen a female crocodile keep guard over the young on the day of hatching. This was revealed to me some years ago, when a particular crocodile kept to one area of the lake close to where the eggs had evidently been deposited. And on the day I discovered the newly hatched young I saw this crocodile rush out of the water, at least a dozen times to drive away, Black-necked Storks (*Xenorhynchus*) Herons (*Ardea*) and large white Egrets (*Egretta*) when they ventured to alight near the young which were lying helpless at the water's edge. I watched this crocodile for the whole day maintaining a scrupulous guard over its young. This crocodile was afterwards shot and was confirmed to be a female. The general belief amongst the rural people here is that the parent crocodile eats its own young, but my observation does not support this belief, on the contrary the female seems to take great care of the young and sees them safe to the water, as the first few hours after hatching are the most critical in the life of the young crocodile.

Another observation that I have made is that, wherever a crocodile has deposited her eggs, she is in the proximity of the site. Although I now regret having shot so many crocodiles without taking a deeper interest in their life history, I am still inclined to believe that the parental instinct (restricted to the female) is aroused by the grunting sound made by the young at the time of hatching, immediately before and after emerging from the eggs. Those who have the opportunity to make systematic studies on the parental behaviour of *C. palustris* will, I feel, find the problem most interesting besides throwing much light on the subject, still unknown.

BHAVNAGAR, K. S. DHARMAKUMARSINHJI
10th April 1947.

[Parental instinct in the great Estuarine Crocodile (*C. porosus*) is well known and there are records showing how assiduously the species guards her 'nest' of eggs and new born young. Little has been observed regarding the mating habits and parental care of the Common Mugger (*C. palustris*).—EDS.]

25.—INDIAN MONITORS IN THE UNITED PROVINCES.

Reference Mr. F. W. Champion's note on the above in volume xxxvii No. 3 of 1934.

It may be of interest to note that *Varanus monitor*, is now reasonably plentiful below Lansdowne Cantt. between 4000 ft. and 5000 ft. It is my misfortune to have to travel frequently between Lansdowne and Kotdwara by car, (the road is appalling), and it is seldom that one does not see at least one specimen.

I can confirm what Mr. Champion says about the breeding season for early in June last year I saw an exceptionally large specimen that was obviously gravid, and so 'heavy' that it had difficulty in getting out of the way of my Jeep.

For many years a large *Goh* lived under the water tanks in our Mainwaring Lines—from 1921 to 1927. The Burma Rifles who relieved my battalion here in 1927 ate this one within a week of their arrival.

As Mr. Champion says they also wiped out a large green blue lizard that used to be very common here, and it is still extremely scarce indeed. This regiment also rid the Cantonment of porcupines, but unlike the lizard, these have returned in their dozens.

LANSDOWNE, U.P.,
7th May 1947.

D. G. LOWNDES,
Colonel
The Royal Garhwal Rifles

26.—DISCOVERY OF THE HITHERTO UNKNOWN FEMALE OF THE BUTTERFLY *CHARANA CEPHEIS* DE NICEVILLE

The specimen, which on the evidence recorded below may be accepted as the female *cepheis*, was taken by me at Laisong (3500 ft.) in the Barail range of the North Cachar Hills in April 1946. It was captured on a tall bush at the moment of settling.

Swinhoe described and figured what he took to be the female of *cepheis* in Lepidoptera Indica. Brigadier Evans says that Swinhoe's type specimen which is in the British Museum turns out on examination to be merely a variety of *Jalindra indra*. Swinhoe was accordingly deceived and wrote in error. Subsequent descriptions in other text books are based on Swinhoe's, and so are likewise erroneous.

The *Cepheis* is therefore only known from the male type in the Calcutta Museum. It was well figured by De Niceville. Comparison shows that my female on the underside resembles it more closely than *mandarinus* or *indra*. On the upperside it differs from the female of these species in a striking and remarkable manner.

On the fore wing the centre third is pure white (entirely brown in *mandarinus* and *indra*). On the hind wing the costa and apex are white while the remaining half is shaded white with black veins (brown with a narrow white band in *indra* and *mandarinus*).

The similarity to the male *cepheis* on the underside and the fact that there is no other known male to match it is fairly conclusive. Both Brigadier Evans and Dr. Corbett who have examined my specimen are of opinion that it is the female of *cepheis*. It may accordingly be accepted and placed on record as such.

Haflong,
North Cachar Hills,
Assam,
19th October 1946.

M. E. ST. JOHN PERRY.

27.—THE ENEMIES OF *DANAUS CHRYSIPPUS* (LINNAEUS)

In support of the observations of Sevastopulo (1933, *Journ., Bomb. Nat. Hist. Soc.* 36(4): 1014) that *D. chrysippus* (L.) feeding on *Asclepiadaceae* have natural enemies we may add that we got the chalcid *Trichogramma evanescens minutum* (Riley) parasitizing the eggs and two species of Tachinid flies, *Sturmia wainwrighti*

Baranoff and an another species of *Sturmia* from the larvae and pupae of the butterfly *D. chrysippus* (L.) which feeds on *Calotropis gigantea* Br. (Mukerji and Behura. *Journ., Bomb. Nat. Hist. Soc.*; in press).

The following references may also be added to the list given by Sevastopulo (1933):—

Larvae of this butterfly feeding on *C. gigantea* Br., are much attacked by ichneumons (T. R. Bell. 1909. *Journ., Bomb. Nat. Hist. Soc.* 19(1):52).

The adult butterflies are attacked by drongos (*Dicrurus*) (H. L. Andrews, 1910, *Journ., Bomb. Nat. Hist. Soc.* 20(3): 850), by mantis (H. D. Peile, 1910, *Journ., Bomb. Nat. Hist. Soc.* 20(3): 873 and also by the lizard *Calotes* which devours both palatable and distasteful butterflies (H. Jouguet, 1927, *Journ., Bomb. Nat. Hist. Soc.* 33 (2): 453).

ENTOMOLOGICAL LABORATORY,
DEPARTMENT OF ZOOLOGY, DURGADAS MUKERJI,
UNIVERSITY COLLEGE OF SCIENCE, BASANTA KUMAR BEHURA.
CALCUTTA,
4th February 1947.

28.—NOTE ON THE OCCURRENCE OF *BIPALIUM* IN JUNAGADH (KATHIAWAR)

Bipalium belongs to the Phylum Platyhelminthes, to the class *Turbellaria*. Unlike parasitic Platyhelminthes, free living forms have not received considerable attention at the hands of zoologists in India. The first described land planarian of India in the year 1899 was *Bipalium smithi* (v.Graff). The land planarians from the Abor country collected by Mr. Kemp are recorded by Whitehouse (1 and 2) and from the Andamans by Kaburaki (3). In all 13 species of *Bipalium* are recorded from the Abor country on the Indo-Tibetan border, the Eastern and Western Himalayas, North Bengal, Assam, Nilgiri, Coimbatore, Travancore, Cochin and the Andamans. They were found at altitudes varying from 300 to 3000 feet above sea level.

A single solitary specimen of this animal was first observed at Motibag in the month of July 1938; and again at Datar Manzil in the monsoon of 1939. Thereafter in the month of July of 1944 several individuals of various sizes were seen crawling under or on stones and even on the tree trunks of the Girnar Hills. In order to kill these animals in extended condition they were dipped in water to which at intervals a drop of 5% formalin was added till they become motionless. They are then preserved in 50% Glycerine alcohol.

From the external features these animals comply with the typical *Bipalium* outline with semicircular head lobes. The trunk tapers gradually towards the regions of the neck and the tail. The colour of the body in the living animal was observed to be shining dark chocolate colour on the dorsal surface; while it was light chocolate colour on the ventral surface. In the preserved animal dorsal surface presents the dull dark chocolate colour, while the ventral surface shows variation in colour from pale chocolate to ash brown colour. From the neck to the extreme posterior end there is a prominent raised ridge of slight dirty white colour on the midventral surface known as ambulacral surface. This is somewhat wider at the mouth and genital apertures. In two specimens the pharynx is seen protruded through the mouth as a cream or pale yellow frill.

Table 1 gives the measurements of four intact animals from the Girnar hills. These measurements are those of the preserved specimens; but these animals in living state are capable of extending and hence there is apt to be more or less slight variations in these measurements than those recorded here.

TABLE 1

		mm.	mm.	mm.	mm.
1	**Length of the body** ...	43	50	63	74
2	**Breadth of the body** ...	4	5	4	5
3	**Thickness of the body** ...	3	2	2	3
4	**Breadth of the head lobe** ...	3	4	5	5
5	**Breadth of the ambulacral surface** ...	1	·75	·75	1·25
6	**Position of the mouth from the anterior end** ...	22	25	28	36
7	**Position of the genital pore from the end** ...	29	33	39	48
8	**Distance between the mouth and genital pore** ...	7	8	11	12

It is seen from the above table that the smallest specimen measured 43 mm. in length, and 4 mm. in breadth whereas the largest was 74 mm. and 5 mm. in length and breadth respectively. Thickness of the body varies from 2 mm. to 3 mm. These include the raised ambulacral surface of the ventral side. The breadth of the head lobe varies from 3 mm. to 5 mm. The breadth of the ambulacral surface varies from 75 mm. to 1.25 mm. The position of the mouth is more or less about half-way from the ventral surface; while that of the genital pore is more or less two-third way along the ventral surface from the anterior end or about one-third way from the posterior end. The genital pore is behind the mouth and the distance between the mouth and the genital pore varies from 7 mm. to 12 mm. All four intact specimens have both the apertures quite visible.

One of these specimens was sent to the Director, Zoological Survey of India, for correct specific identification. Dr. B. S. Chauhan identified it as *Bipalium* prox. *sylvestre* Whitehouse. According to him it shows closer resemblance to *B. sylvestre* than any other described species or genus. As there was only one specimen available to him he was unable to give any definite specific name to it or to say whether it is a new species.

These specimens are from the first record of the species from Junagadh in Kathiawar.

The author expresses his sincere thanks to Dr. B. N. Chopra and especially to Dr. B. S. Chauhan for their kind help.

Bahauddin College,
Junagadh, G. A. KAPADIA
6th May 1947.

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1. Whitehouse, R. H. (1914) Land Planarians. Rec. Ind. Mus. Vol. VIII, Pt. VI, pp. 455-464.
2. Whitehouse, R. H. (1918) Indian Land Planarians. Rec. Ind. Mus. Vol. XVI, Pt. 1, pp. 29-40.
3. Kaburaki, T. (1925) Planarians from the Andamans. Rec. Ind. Mus. Vol. XXVII, Pt. II, pp. 2932.

29.—FLOWERING OF BAMBOOS

Our local 'ringal' is *Arundinaria falcata* Nees, and until this year was plentiful in the jungle and commonly transplanted into gardens where it was of great ornamental value. Last year, however, mass flowering of this species took place and I now know of only three or four clumps remaining, which for some reason failed to flower and perhaps half a dozen small plants that had been transplanted during the rains in 1945. I also noticed this species flowering in Simla and in Dehra Dun so that it must have been general throughout its range.

I should be most interested to know what the flowering cycle of this species is? My Mess Mali, who has been in our employ since 1911 tells me that he had never known this ringal to flower till last year. This gives a cycle of at least 35, and probably of 40 years.

Lansdowne, U.P., D. G. LOWNDES
7th May 1947. *Colonel,*
The Royal Garhwal Rifles.

ANNUAL REPORT OF THE BOMBAY NATURAL HISTORY SOCIETY FOR THE YEAR ENDING 31st DECEMBER 1946

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THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1946.

THE SOCIETY'S JOURNAL.

Volume 46, Nos. 1, 2 and 3 were published during the year.

MAMMALS

Two interesting papers on little known mammals were published during the year. The first of these entitled 'The Riddle of the Bearded Pig' by J. E. Kempe, deals with the distribution of *Sus barbatus* of Sumatra and Borneo and its present occurrence in the Malay Peninsula where it had not been known to occur since Neolithic times. The known facts are that the Bearded Pig has in recent years reappeared in the south and east of the Malay Peninsula in small numbers. The author discusses the question as to whether this species by its presence today is to be regarded as indigenous to Malaya or whether it is now re-establishing itself after a period of extinction.

Mr. R. I. Pocock has published two volumes on mammals in the new edition of the Fauna and is now engaged in writing a third, dealing with Ungulates. He appealed to the Society for a series of skins and skulls of the Wild Ass which inhabits the deserts of Kutch. No material was available in museums for the study of this species. Thanks to the generosity of His Highness Maharao Shri Vijayarajji of Kutch, an expedition was sent to the Rann of Kutch to secure material and data about this little known animal. Mr. Sálim Ali who was in charge of the expedition, gives an interesting account of the conditions in which these wild asses live in the Rann of Kutch, their numbers and breeding habits. The young wild ass is not difficult to capture and unlike the adults, is easily tamed. They are sturdy and fleet of foot and the author believes that mules bred from them should prove a satisfactory proposition. It is an experiment well worth attention.

During the year under review, we published the concluding articles on Sport in Assam, which were of so much interest to sportsmen. They are a record of the more spacious days of the past and of big game hunting in one of the finest Provinces in India.

BIRDS

During the first world war, many members of the Society serving with the Forces in Mesopotamia, actively interested themselves in collecting specimens and making field notes, which provided the basis of the volume on the Fauna of Mesopotamia, which was published under the aegis of the Society. The grimmer conditions under which the second world war was fought, apparently left little time for such exploration. Nevertheless, there were a few members of the Society who were able to give some attention to Natural History interests. Among these is Lt.-Genl. Sir Philip Christison who during his campaigns in Arakan in 1943 and 1945, interested his staff officers in making observations and collecting notes on the bird life of the area. A paper by Genl. Christison, Major A. Buxton and Major A. M. Emmet, assisted by Dr. Dillon Ripley of the U.S.A., gives field notes on the birds of Coastal Arakan and the Foothills north of the Yomas. These notes provide a foundation for a more critical study of the avifauna of Arakan and must prove of value in the preparation of the second edition of that classic book 'The Birds of Burma'. Similar is the purpose of Col. J. K. Stanford's 'Suggestions for Field Ornithologists in Post War Burma'. Like Genl. Christison, he provides additional data for Smythies's excellent book and indicates to future young naturalists in Burma the many opportunities that still exist for adding to the knowledge of the bird life of the country.

The Birds of the Anamalai Hills (Cochin), the subject of a paper by C. R. Stonor, is based on observations made by him in the ever green and deciduous forests of the north area of the Anamalai range. The paper is a useful contribution to the ornithology of the South Indian hill ranges.

In the August number (Vol. 46, No. 2), Mr. Sálim Ali gives a graphic account of an ornithological pilgrimage to Lake Manasarowar and Mount Kailas. This hallowed region is virtually forbidden ground to Europeans, which is perhaps the reason why so little has been recorded of its natural history. Mr. Ali's objective was to study the natural conditions under which birds live in this desolate region, to ascertain what species breed in the area and to determine the ecological factors which favour their doing so. Admonition by the authorities not to carry a gun, lest he offend the religious scruples of the Tibetans, who are averse to other people killing any animals, prevented Mr. Ali from collecting specimens. He was able to make notes on the bird life of the region and of the transitions which occur in the character of the avifauna as one passes from the Indian into the Tibetan zone. His paper makes interesting reading and concludes with a list and notes on the birds observed by him.

An appropriate pendant to Mr. Ali's observations, is Mr. Frome's article on the birds seen on the main Hindustan-Tibet Road between Mahasu and Narkanda in the Simla Hills and along the mule track to Baghi. It is a region of cliffs, ravines and stretches of dense forest, alternating with open hill sides. Its bird life includes a variety of forest haunting birds, as well as those which favour more open and cultivated country, as instanced by the occurrence of such common plains species as the sparrow, the mynah and the common pariah kite.

Mr. E. H. N. Lowther's notes and photographs of Indian birds are always welcome in our *Journal*. He crowns many fine camera studies of Indian birds which we have published with photographs of the majestic Lammergeier at home in its Himalayan fastness. His article gives a graphic account of the family life of these great birds. The thanks of the Society are due to him for his many attractive contributions to the pages of the *Journal*.

Birds photography is becoming increasingly popular in India. Our *Journal* provides evidence of this. Kashmir with its fine scenery and the unequalled opportunities it offers to the camera hunter, is possibly the most attractive venue for his efforts. Both Col. B. T. Philip's and Mr. Loke's articles deal with portraits of bird life in this delectable region and both provide interesting notes and observations of their experiences.

REPTILES

Since the retirement of Col. F. Wall, than whom no man has contributed more to our knowledge of Indian snakes, the study in India of these reptiles has somewhat languished. We welcome Mr. Acharji's notes on snakes of Benares, based on a collection made at 'Kaiser Castle'—the war-time home of the Zoological Survey of India.

Mr. Charles McCann contributed an important study on the hemipenis in reptiles. It is already well known that there is a considerable variation in the structure of the hemipenis from genus to genus and in some instances from species to species. Although some herpetologists have attempted a classification of snakes, based mainly on the morphology of these structures, there is plenty of room for further study. McCann's study of fresh material and not of spirit specimens, sheds much new light on this field of research. Readers of the *Journal* will learn with regret of Mr. McCann's impending departure from India. We express the hope that he will continue to contribute to the *Journal* and to the store of knowledge of Indian Zoology and Botany, to which his researches have added so much.

FISHES

Major Macdonald concluded his serial on the Mahseer and other Game Fishes. The whole series is being reprinted in book form and will provide an up-to-date and comprehensive handbook and guide to anglers in India.

The literature on the life histories of Indian fishes is scanty and scattered in scientific periodicals—not always easily available. Mr. S. Jones has endeavoured to bring the available information together in his articles on the breeding and development of Indian freshwater and brackish-water fishes. The editors of the *Journal* had invited Mr. Jones to undertake this work so as to arouse interest in the subject among members of the Society. Breeding and developmental studies of fishes are full of interest and offer plenty of scope to those willing to devote attention to them. Though the specialists will find Mr. Jones's articles useful, his work is intended primarily for field naturalists.

That king of Indian fishes, the Mahseer, its ways and habits are always of interest. An informative article dealing with the migration, breeding habits and taxonomy of this fish was written by Mr. K. De B. Codrington. It is a useful supplement to the papers on Indian Mahseers by Dr. S. L. Hora, which were published in the *Journal* some years ago.

Many useful papers on pisciculture have been published by the Society. Fishes provide a supplementary source of food supply, second only to agriculture, and studies contributed to the development of our fisheries are of real importance. During the year we published 'A Fishery Survey of the River Indus' by Dr. Hamid Khan; 'The Freshwater Fish and Fisheries of Ahmedabad' by Dr. S. B. Setna, Director of Fisheries, Bombay, and Mr. Jones's paper on the 'Destructive Methods of Fishing in the Rivers of the Hill Ranges of Travancore'.

INSECTS

Mr. D. G. Sevastopulo continued his studies on 'The Early Stages of Indian Lepidoptera'. Parts XIV, XV and XVI were published during the year.

Other scientific papers include the description of a new species of beetle *Peschetius andrewsi* and a new genus and species of Mycrodytes, by J. Balfour-Browne of the Department of Entomology, British Museum.

Capt. H. J. C. Larwood describes and illustrates new species of Indian Lithobiidae.

Mr. M. Atiqur Rahman Ansari published an article on the

'Association between the Mallophaga and the Hippoboscidae infesting Birds'.

To the long series of local lists of butterflies, published by the Society which have added so much information covering the status and distribution of species, we add two papers, one dealing with the Butterflies of the Kaira District by Dr. H. C. Aldrich, the other on the Butterflies of the Arakan Coast, by Major J. C. Gladman. His list was compiled from a collection and observations made by him during the third and final Arakan campaign between November 1944 and end of June 1945.

Economic Entomology finds place in an important and useful paper by Messrs. K. N. Trehan and S. V. Pingle on the crop pests of the Bombay Province. Mr. T. V. Venkatraman describes a New Coccid Pest of Sugarcane in India. The author deals with the life history of the species, the nature of damage caused by it and its distribution in India.

BOTANY

Three further parts of the serial on 'Some Beautiful Indian Climbers and Shrubs' were published during the year. Twenty-four parts have so far appeared and six further parts will complete the serial. The Society hopes to publish these papers in book form as a companion volume to Blatter and Millard's fine work on 'Some Beautiful Indian Trees'.

Mr. McCann's 'Observations on the Sterculias of the Bombay Presidency', are based on a critical study of the various species included in the genus, as originally understood by Cooke and other botanists. The author corrects, amends or explains erroneous and obscure details in the existing descriptions.

A paper on South Indian Commelinas including descriptions of two new species from South India, was contributed by the late Edward Barnes, whose death removes from our scene a keen student of Indian Botany.

A second series of New Plant Records for the Province of Bombay was written by the Rev. H. Santapau.

Mrs. Ella Gonsalves and Mr. Dwarka B. Joshi contributed a study of the freshwater Algae occurring near Bombay.

We were able during the year to publish Mr. F. Kingdon Ward's additional notes on the Botany of North Burma. Mr. E. J. H. Corner, now Assistant Director of the Singapore Botanic Garden, when a prisoner of war fortunately had been able to pursuade the Japanese to preserve Kingdon Ward's diaries in the Library of the Botanic Garden. The author was thus able to add considerably to his Sketch of the Botany of North Burma, which originally was written largely from memory and rough notes which he had made after he had left Singapore in 1941.

In concluding this review of the *Journal* we wish to thank all those who contributed articles or Miscellaneous Notes. The latter are always an interesting feature of the *Journal* and add greatly to its interest and attractiveness.

The Committee regret the delay in publishing the *Journal* which has been unavoidable. Irregular publication has been due to labour and other difficulties affecting the printing trade the world over.

The Committee wish to express their thanks to the Council of National Institute of Sciences of India, for a grant of Rs. 750 made to the Society towards the expenses of publishing the *Journal* during the year.

PUBLICATIONS

Book of Indian Birds. A 4th edition of this deservedly popular work was published during the year. The new edition is revised and brought up-to-date and contains 75 new illustrations, replacing previous plates.

Some Beautiful Indian Trees. Last year the Committee decided to bring out a new edition of this work. Mr. W. S. Millard who with Rev. Fr. Blatter was the joint author, has since secured estimates for printing the new edition and orders have been placed with Messrs. Oliver & Boyd, Edinburgh, Scotland, to print 2,000 copies of the book.

Book of Indian Animals. This book written by Mr. S. H. Prater, the Society's Curator, will form Volume II of the Indian Natural History Series. It is being printed off and publication is expected in October 1947.

Book of Indian Butterflies. As stated in the previous annual report, the Committee decided to publish this work which has been written by Mr. Wynter-Blyth. It will take the same format as the Book of Indian Birds and will form the third volume in the Indian Natural History Series. Preparing illustrations in colour and black and white of some 500 or more species, which will be a feature of the work is necessarily a long process. It is unlikely that the book will go to the press before next year.

Circumventing the Mahseer. Publication of this work by Major Macdonald, which originally appeared as a serial in the *Journal*, is expected in the course of the year.

REVENUE ACCOUNT

Actual receipts amounted to Rs. 41,389-12-0 as compared with Rs. 55,351-6-0 during the year 1945. The decrease in revenue of Rs. 13,961-10-0 was due mainly to decrease in sales of publications which amounted to Rs. 26,333-3-0 in 1945 as against Rs. 9,280-1-0 in 1946.

Life Members. During the year 1946, 12 Life Members died and 8 joined, decreasing the total number from 205 to 201.

In 1946, 89 new members (including above) joined, 69 resigned and 11 died. The total number of members on 31st December 1946, was 1,289, an increase of 9 over 1945.

ACKNOWLEDGMENTS

The Committee wishes to record its acknowledgements to Mr. W. S. Millard, for his continued help in looking after the Society's interests in London.

STAFF

The Committee also wishes to record its appreciation of the services of the Curator and staff, whose loyal and devoted service is helping the Society to carry on in these critical times.

ADDITIONAL NOTE BY HONORARY SECRETARY

READ OUT AT THE ANNUAL GENERAL MEETING ON 21 AUGUST 1947

1. To encourage active field work in natural history—so lacking among Indian students—the Society's Managing Committee decided to award a scholarship, or scholarships, aggregating Rs. 600 per annum to selected students who found it difficult to finance their field trips. The scheme was widely advertised on college notice boards throughout the city and 2 applicants were selected, one working on a problem connected with Bats, the other on Algae. The work so far done by the bat investigator is not altogether satisfactory, while the algae student refunded the grant after a time as he was unable to carry out his proposed work. While the outcome of our efforts have not proved promising, it is proposed to give the scheme a further trial.

2. While our membership during the 8 months of this year has been fairly stable (57 resigned, 55 joined) it is anticipated that the political change-over may affect it adversely to begin with. An analysis of our membership significantly reveals that of a total of 1,000 individual members (ordy. & life) on our list no more than 251 are Indians, the rest being Europeans, a large number of whom officials of Government. Efforts are being kept up to induce educational institutions, planters and others to join the Society, but the response is only moderately satisfactory. It has been found that the best means of obtaining more members is through personal contact by those who are already on our rolls. Each member must surely know a small group of persons who share his interest in one branch or other of natural history or sport. Some of these could be induced to join and help to further the good work the Society is doing. If each member will, in true missionary spirit, try and enroll even a single other individual in the course of the year our membership could be doubled in 1948, and the Society would find itself in a stronger and surer position for continuing its activities.

3. It is unfortunate that we have no suitable rooms of our own to house our offices, library and reference collections. The present rooms in Apollo Street are part of Messrs. Phipson & Co's premises, kindly rented to us by that firm at some inconvenience to itself. They are congested and wholly inadequate in other ways. There is no proper reading room nor any facility possible for members who wish to do serious research. The library here is far removed from the study collections which are piled up and littered helter skelter in a back room of the Prince of Wales's Museum 500 yards away. This makes co-ordination with literature and references extremely difficult in any kind of systematic work. The premises in Apollo Street are old and highly inflammable. They are made more so by the large stock of Messrs. Phipson's wines and spirits on the ground floor, below. Our library is a very valuable one and contains a number of rare books and journals. It forms a considerable part of the Society's material assets. In its present location there is constant danger from fire, and if by great

(*Continued on page* 193)

BOMBAY NATURAL HISTORY SOCIETY.

Dr. *REVENUE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1946.* *Cr.*

	Rs A P	Rs A P		Rs A P	Rs A P
To Salaries (including Dearness Allowance)	31,683 12 0		By Subscriptions	21,657 4 3	
,, Society's Contribution to Staff Provident Fund	1,661 6 0		,, Entrance Fees	925 1 9	
,, Bonus to Natural History Section ...	1,337 0 0		,, Sales of :		
,, General Charges	855 5 1		Old Journals	1,887 10 11	
,, Rent	2,436 0 0		Game Books, Vol. III	251 7 6	
,, Stationery and Printing	489 12 0		Society's Publications	1,577 0 7	
,, Postage	874 2 0		Snake Charts	209 11 0	
,, Library	527 10 7		,, Profit on Sales of :		
,, Audit Fee	250 0 0		Calendars	2,738 3 7	
,, Fire Insurance	152 0 0		Book of Indian Birds, 3rd edition ...	2,616 0 0	
,, Depreciation on Furniture	25 0 0		Profit on outside works ...	2,055 7 8	
,, Cost of Printing Journals	9,912 8 8		Interest on Investments	6,577 15 0	
,, Printing cost less Sales of Book of Indian Birds, 4th edition	16,572 12 0		, Profit on sales of 3½% Pro-Notes, etc. ...	893 14 0	41,389 12 3
		66,777 4 4	,, Loss carried to Balance Sheet		25,387 8 1
Total ...		66,777 4 4	Total ...		66,777 4 4

PUBLICATION ACCOUNT FOR THE YEAR ENDED 31st DECEMBER 1946.

	Rs A P	Rs A P		Rs A P	Rs A P
To some *Beautiful Indian Climbers and Shrubs* :			By Balance carried to Balance Sheet ...		4,062 1 4
Expenditure to 31st December, 1945 ...	3,771 15 4				
Expenditure during the year to 31st December, 1946	290 2 0	4,062 1 4	,, Balance carried to Balance Sheet ...		75 0 0
,, *Book on Poisonous Terrestrial Snakes* ...		75 0 0	,, Sale Proceeds of Books of Indian Birds, 4th edition	7,930 7 0	
,, *Book of Indian Birds, 4th edition* Expenditure during the year 1946 ...		24,473 3 0	Margin carried to Revenue Account .	16,572 12 0	24,473 3 0
,, *Printing Charges of Calendars* ...	5,234 7 0				
Margin carried to Revenue Account ..	2,738 3 7	7,972 10 7	,, Sale Proceeds of Calendars		7,972 10 7

Dr. *Cr.*

ORNITHOLOGICAL SURVEY ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1946

Ornithological Survey	Rs A P	Rs A P		Rs A P	Rs A P
To Balance carried to Balance Sheet ...		1,252 1 0	By Unexpended Balance as per last Balance Sheet		1,252 1 0
Total ...		1,252 1 0	Total ...		1,252 1 0

BOMBAY, *11th April 1947.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants } AUDITORS.
Registered Accountants }

BOMBAY NATURAL HISTORY SOCIETY.

BALANCE SHEET AS AT 31st DECEMBER, 1946.

LIABILITIES		Rs A P	Rs A P
Life Membership Fees:			68,900 0 0
Donations for specific purposes:			
Unexpended:			
Ornithological Survey		1,252 1 0	
,, ,, (Travancore) ...		1,000 0 0	
Donations from States for expenses ...		13,900 0 0	
,, for Book of Indian Animals.		1,626 10 3	
			17,778 11 3
Sundry Creditors:			
The Diocesan Press—Account Journal ...		4,200 0 0	
British India Press—Account Book of Indian Birds		16,724 0 0	
For Expenses:	Rs A P		
Audit Fee	250 0 0		
Mrs. E. C. Stuart Baker (Commission on sales of Game Books)	251 7 6		
		501 7 6	
For Others:			
Lt. J. N. Corlett ...	119 6 0		
Mr. A. S. Archibald ...	15 12 0		
		135 2 0	
			21,560 9 6
Surplus Assets:			
Balance as per last Balance Sheet ...		65,409 9 0	
Add.—Donation from H.E.H. The Nizam for expenses transferred		5,000 0 0	
		70,409 9 0	
Less—Loss on Revenue Account		25,387 8 1	45,022 0 11
Total ...			1,53,261 5 8

ASSETS	Rs A P	Rs A P
Investments—At Holding value or Market value whichever is lower:—		
Rs. 30,000 3½% Loan 1947-50	30,675 0 0	
,, 10,000 3% do. 1951-54	9,800 0 0	
,, 14,000 4% Bombay Port Trust Bonds.	10,780 0 0	
,, 15,000 4% Bombay Improvement Trust Bonds	11,400 0 0	
,, 26,000 3% Funding Loan 1966-68 ...	25 565 0 0	
,, 25,000 3% Conversion Loan 1946 ...	25,000 0 0	
,, 15,000 3% First Development Loan 1970-75	14,615 10 0	
Rs. 1,35,000 (Market value at 31st Dec. 1946—Rs. 1,42,959-2-0).	1,27,835 10 0	
£460 3% Defence Bonds	6,133 5 4	
		1,33 968 15 4
Sundry Debtors		6,534 1 0
Advances:		2,503 9 0
To Staff		
,, Poisonous Terrestrial Snakes of India, Burma and Ceylon		75 0 0
,, Some Beautiful Indian Climbers and Shrubs		4,062 1 4
,, Book of Indian Butterflies		25 13 0
Cash—		
With National Bank of India, Ltd., Bombay	542 13 2	
With National Bank of India, Ltd., London, £268-16-1	3,584 0 10	
On hand	250 0 0	
		4,376 14 0
Furniture:		
As per last Balance Sheet	1,740 0 0	
Less—Depreciation...	25 0 0	
		1,715 0 0
Total ...		1,53,261 5 8

Note.—A stock of 22,100 old Journals, and valuable research collections and Library of 2,710 volumes have not been taken into account on the Assets side of the Balance Sheet.

We have prepared the above Balance Sheet from the Cash Book and from the information given to us, and have verified the Investments.

In our opinion, such Balance Sheet represents a true and correct view of the state of the Society's affairs according to the best of our information and explanations given to us.

BOMBAY, *11th April, 1947.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants } AUDITORS.
Registered Accountants }

BOMBAY NATURAL HISTORY SOCIETY

BUDGET FOR THE YEAR 1947

Particulars RECEIPTS	Budgetted for 1946	Actual Receipts	Budget for 1947	Particulars PAYMENTS	Budgetted for 1946	Actual Payments	Budget for 1947
	Rs A P	Rs A P	Rs A P		Rs A P	Rs A P	Rs A P
Opening Balance	15 495 0 0	...	1,285 4 0	Salaries (including Dearness Allowance)	26,150 0 0	26,910 12 0	31,795 0 0
Subscriptions	22,000 0 0	21,657 4 0	19,000 0 0	Three Months' Bonus to Staff ...	4,775 0 0	4,773 0 0	...
Entrance Fees	1,000 0 0	925 2 0	1,000 0 0				
Sales of :—				Bonus to Natural History Section Staff	...	1,337 0 0	...
Old Journals	2,500 0 0	1,887 11 0	2,000 0 0	Society's Contribution to Staff Provident Fund	1,665 0 0	1,661 6 0	1,810 0 0
Game Book, Vol. III... ...	400 0 0	251 7 0	250 0 0	General Charges	400 0 0	855 5 0	400 0 0
Society's Publications ...	300 0 0	1,577 0 0	300 0 0	Rent	2,440 0 0	2,436 0 0	2,440 0 0
Snake Charts	200 0 0	209 11 0	200 0 0	Stationery and Printing ...	350 0 0	489 12 0	400 0 0
Margin on Sales of Calendars ...	3,000 0 0	2,738 4 0	3,000 0 0	Postage	800 0 0	874 2 0	800 0 0
.. .. Book of Indian Birds	5,000 0 0	2,616 0 0	5,000 0 0	Library	500 0 0	527 10 0	500 0 0
Interest on Investments ...	4,500 0 0	6,577 15 0	4,500 0 0	Audit Fee	250 0 0	250 0 0	250 0 0
Margin on outside Works ...	500 0 0	2,055 8 0	500 0 0	Fire and Riot Risk Insurance ...	160 0 0	152 0 0	160 0 0
Profit on Sales of 3½% Pro-Notes.	...	893 14 0	...	Depreciation on Furniture ...	25 0 0	25 0 0	25 0 0
3½% Securities sold Face Value...	...	10,100 0 0	...	Cost of Printing Journals ...	10,000 0 0	9,912 9 0	10,000 0 0
Loss	...	...	11,544 12 0	Balance carried to next year's Account	7,380 0 0	1,285 4 0	......
Total ...	54,895 0 0	51,489 12 0	48,580 0 0	Total ...	51 895 0 0	51,489 12 0	48,580 0 0

BOMBAY, *11th May, 1947.*

Honorary Treasurer.

misfortune this ever happens there will be little chance of saving this fine collection of books which it will be almost impossible to replace.

It is felt that one of the urgent needs of the Society is to find more suitable housing, in a more congenial and less cramped setting. It should be inviting enough for members, particularly up-country members, passing through the city, to spend an hour or two pleasantly browsing amongst natural history books and periodicals, and making contacts with other members with kindred interests. This is a matter which deserves our earnest consideration. As soon as we are in a position to gauge what the Society's future and financial position is likely to be, the necessary efforts will have to be launched.

4. The Committee would, at all times, welcome constructive suggestions for increasing the usefulness of the Society to its members and to the general public. It feels that in future we shall have to lay more and more stress on publications of a more or less popular nature, and particularly in the Indian languages. As a beginning, we have under preparation at the moment a couple of simply written booklets with coloured illustrations, one on Birds, the other on Poisonous Creatures (including scorpions, centipedes, certain spiders etc.). It is proposed to bring out small editions simultaneously in Hindustani (both scripts), Mahratti, Gujarati and Kannada. It is hoped that authoritatively written and well illustrated primers of this sort will find favour with the educational departments of the various provincial governments as well as the general public, and prove a means not only of adding to the Society's usefulness to the public but also incidentally to its own revenues.

MINUTES OF THE ANNUAL GENERAL MEETING OF THE BOMBAY NATURAL HISTORY SOCIETY HELD IN THE LECTURE ROOMS OF THE B.E.S.T. COMPANY ELECTRIC HOUSE, ORMISTON ROAD, BOMBAY, ON THURSDAY THE 21st AUGUST 1947 AT 6 P.M.

1. Managing Committee's report for the year ended 31st December 1946, copies of which were placed in the hands of members, was considered as read.

2. The Honorary Secretary read out some additional notes dealing with the Society's activities and membership position during the 8 months of 1947, and pointed out the urgency of an unceasing membership drive so as to insure the Society's future under the new conditions created by the political change in India. See p. 187.

Copies of the Balance Sheet and Statement of Accounts had not been printed owing to shortness of time, paper restrictions and press labour difficulties. A copy was passed round to members present, and after necessary remarks and explanations by the Honorary Treasurer and Honorary Secretary, the accounts were passed.

3. The Executive and Advisory Committees for 1947, as proposed and circulated to members, were duly elected, there being no fresh nominations received. Mr. Sálim Ali proposed the name

of Lt.-Col. J. E. Clutterbuck to fill the 10th vacancy on the Executive Committee (in accordance with Rule 31). The proposal was duly seconded and Col. Clutterbuck was declared elected.

4. The Chairman reiterated the seriousness of the Society's financial position in the future unless suitable means were devised to maintain the membership strength and augment our revenues by popular publications and in other ways. Simple illustrated booklets on Natural History subjects were suggested as well as the bringing out of a popular nature magazine. One member suggested making natural history articles a regular feature in the weeklies such as the *Illustrated Weekly of India* in order to make the public natural history minded.

Mr. T. E. Waterfield suggested conducted outings for members and a limited number of their friends interested in different branches of natural history, the friends forming potential members. He also suggested sending out a simple questionnaire to members to ascertain their particular interests. The Honorary Secretary pointed out that curiously enough this last suggestion was already in the process of being acted upon. When answers are received from members it will be possible to tabulate the different interests and to enable those of kindred interests to be brought closer together.

The Chairman then referred to 3 points:—

(1) He conveyed the sad news of the death in England of Mr. R. I. Pocock a distinguished mammalogist and a frequent and valued contributor to the Society's *Journal.* The members expressed their condolence by all standing up, and the Honorary Secretary was requested to convey the Society's condolences to the deceased's family.

(2) The Chairman then announced the news just received of the appointment of Mr. N. B. Kinnear as Director of the British Museum (Natural History). This well deserved elevation of a former Curator reflected glory on the Society, and the announcement was warmly applauded.

(3) The Chairman apprised the members of the impending retirement of Mr. Prater who has been our efficient Curator for over 25 years, and of Mr. McCann, that fine naturalist whose contributions in so many fields of natural history are so well known. He pointed to the difficulty of replacing such devoted and efficient workers and the magnitude of the Society's loss by their going away.

On the conclusion of the formal meeting, a series of movie films of Indian wild life made in the U.P. jungles by Major Jim Corbett of 'Kumaon Man-eaters' fame and kindly lent by him for the occasion of the Annual General Meeting, were shown to members and a large gathering of their friends. The pictures were greatly appreciated and enjoyed, but there was general disappointment at Major Corbett not being able, for reasons of health, to be present and give his commentary in person.

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THE JOURNAL OF THE BOMBAY NATURAL HISTORY SOCIETY

EDITED BY
S. H. PRATER, O.B.E., M.L.A., C.M.Z.S., AND SÁLIM ALI

SMITHSONIAN INSTITUTION
JUN 1 1948
NATIONAL MUSEUM

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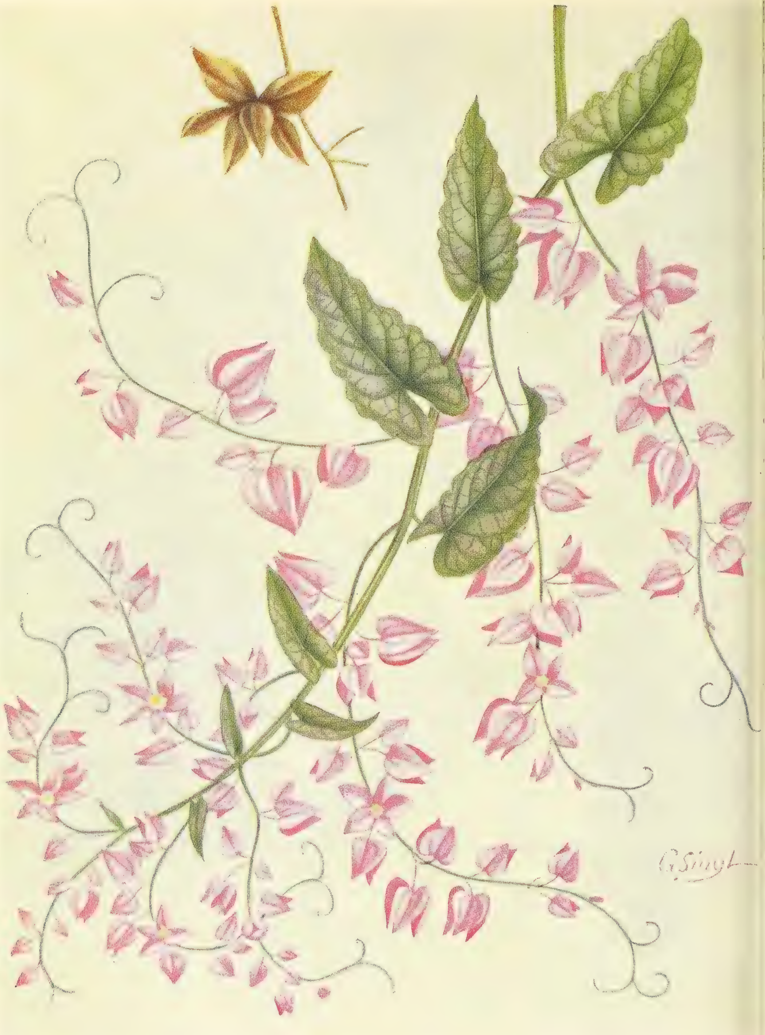

The Coral Creeper
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(nearly natural size)

JOURNAL
OF THE
Bombay Natural History Society.

1947. Vol. 47. No. 2

SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS.

BY

N. L. Bor, C.I.E., M.A., D.SC., F.L.S., I.F.S.,
Forest Botanist,

AND

M. B. Raizada, M.SC.,
Assistant Forest Botanist,
Forest Research Institute, Dehra Dun.

Part XXVII.

(*Continued from Vol.* 47, (1947), p. 25).

(*With* 1 *coloured and* 1 *black and white plate*).

Antigonon Endl.

A genus of the family *Polygonaceae*. The name is derived from the Greek and probably refers to the kneed or angled character of the stem.

Antigonon leptopus Hook. et Arn.

The Coral Creeper; Sandwich-Island Creeper.

(*leptopus* means 'thin- or slender-stalked').

Description.—A herbaceous plant ascending from a tuberous root. Stems green, hairy, angled and grooved. Leaves alternate, 3-6 in. long, ovate or triangular in shape, cordate or sagittate at the base, tapering to the acuminate apex which ends in a short spine, entire or undulate on the margins. Nerves flat on the upper surface of the leaves but very prominent beneath, arching several times within the margins, covered with a short pubescence. Petioles .5-1.5 in. long, hairy; stipular sheaths inconspicuous.

Inflorescence racemose terminal or axillary. The rachis of the inflorescence is slender, angled, clothed with a sparse pubescence and bears branched tendrils by which the plant is enabled to climb. The flowers, rosy-red in colour, are borne on pedicels either solitary or several at a node, each pedicel being subtended by a forked bract. The pedicels are up to 1/3 in. long, jointed about the middle, the upper portion more hairy than the lower. The flowers are hermaphrodite. The perianth segments are five in number, the three outer are broadly ovate in shape, rounded or cordate at the base, while the two inner are narrower and not cordate, about .5 in. long increasing to .9 in. when in fruit. The stamens are 8-9 in number. The filaments are connate into a cup for about half their length, which is extended into teeth which alternate with the stamens. The filaments of the stamens are covered with shortly stipitate glands. The ovary is 1-celled and three-cornered. The ovule is solitary and hangs from a long funicle which is attached to the base of the ovary. Styles 3; stigmas capitate, kidney-shaped. The ripe nut is enclosed within the enlarged, free, stiff, perianth segments.

Flowers.—Throughout the rainy and cold season. Fruits cold season.

Distribution.—Indigenous to South America. Largely grown in gardens throughout the country.

Gardening.—It is a lovely climber of moderate growth, best suited for arbours, verandahs, screening unsightly objects and the like. Propagated by division of the root, layers, cuttings and seeds during the rains. It grows 30 to 40 feet high in good soil. Too much manure or other fertilizer effects a vigorous growth at the cost of flowering. The plants form large tuberous roots and when killed down by heavy frost sprout readily again during the spring.

Antigonon leptopus Hk. & Arn. var. *albus* Hort.—A variety with white flowers. It is not so luxuriant in growth as the type.

An [illegible] **n** [illegible] **m** [illegible] Meissn.

A very hairy species with broader leaves, more numerous flowers and perianth segments twice as long as in *A. leptopus* Hook. et Arn. It is a native of Guatemala.

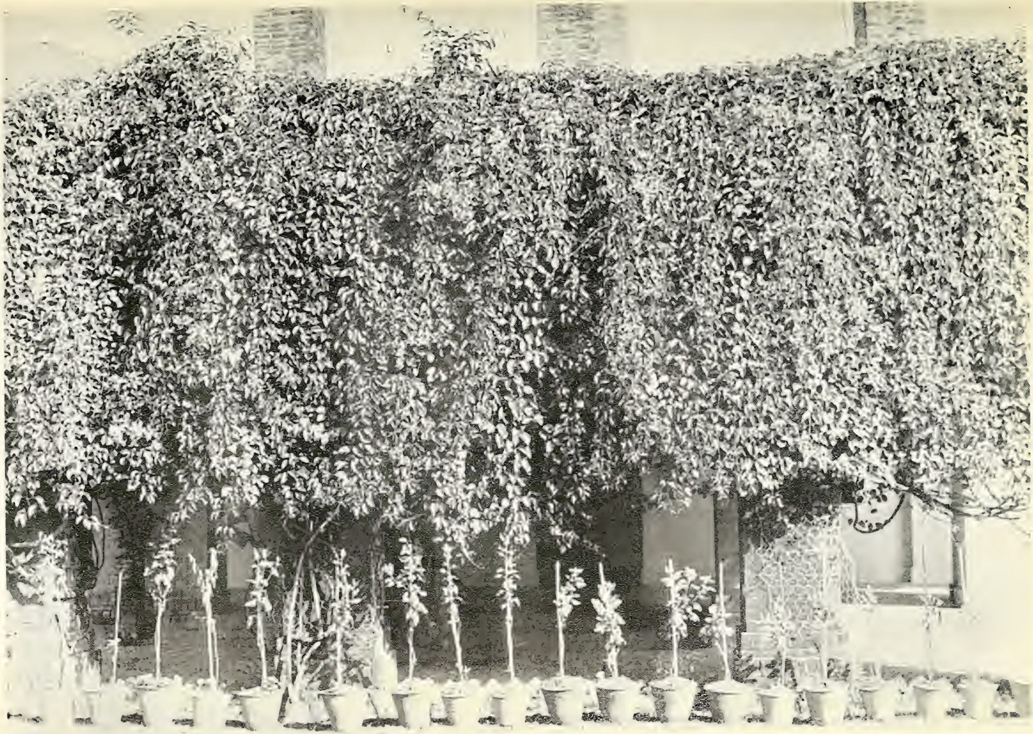


Photo by *M. B. Raizada*

ANTIGONON LEPTOPUS Hook. & Arn.
New Forest, Dehra Dun.

THE EARLY STAGES OF INDIAN LEPIDOPTERA.

BY

D. G. SEVASTOPULO, F.R.E.S.

PART XIX.

(*Continued from Vol.* 47, p. 43).

RHOPALOCERA

PAPILIONIDAE:

Papilio polymnestor Cr., *polymnestor.*

Hors. & Moore, *Cat. Lep. Ins. Mus. E.I.Co.,* i, 101, pl. 3, figs. 1, 1a. 1857.
Davidson & Aitken, *Journ., Bomb. Nat. Hist. Soc.,* v, 366. 1890.
Moore, *Lep. Ind.,* v, 203, pl. 452, figs. 1, 1a, 1b. 1902.
Bingham, *Fauna Brit. Ind.,* Butterflies, ii, 51. 1907.
Talbot, *Fauna Brit. Ind.,* Butterflies, i (2nd edit.), 126, pl. 1, figs. 10, 11. 1939.

4th instar—Head green. Body glaucous green, minutely streaked and speckled with white. A white lateral stripe on the thoracic somites. 5th to 7th somites with a diffuse white lateral patch, the 7th to 9th somites with very diffuse white sublateral markings. A white lateral band on the 10th and 11th somites, and a white sublateral line from the middle of the 5th somite backwards. 1st somite with a back-curved, whitish green, subdorsal spine. 12th somite with a greenish subdorsal spine, 11th somite with a raised, white, subdorsal dot. 3rd and 4th somites somewhat turgid, this area with a transverse series of six raised green points anteriorly and four posteriorly. Legs and prolegs green. Osmeterium pale watery orange.

Final instar—Head green. Body velvety green. 1st somite with a transverse white line anteriorly. 1st to 3rd somites with a whitish lateral line, the area above this suffused with yellow on the 2nd and 3rd somites. A transverse black line between the 2nd and 3rd somites. 3rd somite with a lateral ocellus, consisting of a large blackish-green spot, divided by a white line about a third from the bottom, and surrounded by brownish green anteriorly, yellowish green elsewhere, and with a white dot just above and behind. The ocelli joined by a series of conjoined black rings with diffused lilac spots among them. 4th somite with a transverse band composed of a series of conjoined, olive and whitish, rings and streaks, the whole more or less suffused with lilac. The skin between the 4th and 5th somites velvety black, but only shewn when the larva is extended. A white sublateral stripe from the 5th somite backwards. An oblique white stripe starting from the sublateral stripe on the 7th somite and extending to the subdorsal area of the 8th somite. 10th somite with a triangular white lateral patch conjoined to the sublateral stripe. A transverse white line running across the dorsum of the 12th somite and joining the sublateral stripe on the 11th, behind this line the body greenish white. 8th somite with two lilac dots in the white area subdorsally, 9th somite with a very small, subdorsal lilac dot. Osmeterium pouch with the sides rounded. Subdorsal tubercle on the 12th somite white and fairly large. Osmeterium pale orange. Legs, prolegs and venter paler green. Spiracles brown with a white central slit. 3rd and 4th somites considerably swollen.

Apart from its very much greater size, the larva of the present species can be distinguished from that of *P. polytes* L. by the rounded versus the angled sides of the osmeterium pouch, by the pale orange versus the bright scarlet osmeterium, and by the much larger tubercles on the 12th somite.

Pupa suspended by a girdle and tail pad of white silk. Head produced into two somewhat flattened processes, the inner edge toothed, the outer with a distinct ridge. Thorax with a slight dorsal keel in the form of a flattish, dorsal triangle. 3rd and 4th abdominal somites expanded slightly laterally, so that the abdomen is roughly diamond-shaped in outline. 4th and 5th abdominal somites with paired dorsal tubercles. Colour pinkish buff, slightly mottled with darker. The subdorsal area of the prothorax, and the dorsum of the metathorax and 1st abdominal somite suffused with blackish. A black subdorsal mark on the 3rd and 4th abdominal somites. 5th abdominal somite backwards with the dorsum whitish. Wing cases yellower buff, a dark, triangular discal patch, flecked with green, and a series of raised points at the ends of the veins. There is also a green form of pupa, but I have not encountered it.

Food-plant—*Citrus* spp.

Described from a larva found in Calcutta 6-xii-45, pupated 24-xii-45 and a female emerged 4-iii-46.

Talbot quotes a key compiled by Fryer in 1911 for distinguishing the larvae of *mooreanus* (the Ceylon form of *helenus*), *parinda* (the Ceylon form of *polymnestor*), *romulus* (*polytes*) and *demoleus*, which, strangely enough, ignores the colour of the osmeterium, which is pale orange in *polymnestor* and varies from crimson to vermilion in *helenus*, *polytes* and *demoleus*. Moore (*Lep. Ceyl.*, i, 1880-81) figures and briefly describes the early stages of the Ceylon subspecies *parinda* Moore.

Papilio rhetenor Westw., *rhetenor*.

4th instar—Head green. Body glaucous green, suffused with white laterally on the thoracic, the 5th-6th and 10th-11th somites, a white sublateral stripe from the 5th somite backwards. 1st somite with a subdorsal yellowish tubercle. A slight transverse ridge on the 3rd somite with six polished green points on it, a similar ridge on the 4th somite but with four points only. 12th somite with a green subdorsal tubercle. The dorsum from the 5th somite backwards with indistinct whitish X-shaped marks. 8th and 9th somites each with a subdorsal blue speck, 8th somite with a lateral blue speck in addition. 10th and 11th somite with a slightly raised, subdorsal, green point. Osmeterium yellow. Legs and prolegs green.

Final instar—Head green. Body deep velvety green. 1st somite with a transverse whitish line anteriorly. 1st to 4th somites with a whitish sublateral line. 3rd somite with a lateral black spot with a white speck in it, the spots joined by a series of black-ringed, yellow-green dots, with a series of conjoined black rings immediately in front of them. The posterior edge of the 4th somite with a transverse olive-green stripe, the front edge highly crenulate and with four lavender spots in the indentations, the stripe joined below to the sublateral line. The skin between the 4th and 5th somites velvety black, but invisible unless the larva is extended. 5th somite backwards with a white sublateral stripe. An oblique stripe running from the sublateral stripe on the 7th somite to the subdorsal area of the 8th, this stripe whitish speckled with blackish and containing two lavender dots on the 8th somite. 12th somite with a white transverse line, joining the sublateral stripe on the 11th somite, behind this line the body is whitish spotted with black. 12th somite with very small whitish subdorsal tubercles. Legs green. Prolegs green with two horizontal black bands. Venter green, the abdominal somites with a broad whitish median stripe. Spiracles buff, the central slit white. Osmeterium yellow.

Pupa suspended by a girdle and tail pad of whitish silk. Head produced into two forward pointing processes, slightly dentate internally, the external edge with a distinct ridge. Thorax with a low, triangular keel. Abdomen widest across the 3rd somite. The 4th and 5th abdominal somites with paired dorsal tubercles. Colour pale buff, the head, pro-thorax and thoracic keel blackish brown. A blackish subdorsal mark on the 3rd and 4th abdominal somites. The 5th abdominal somite backwards with the dorsum whitish. Wing cases with a blackish, triangular, discal mark. There is, presumably, also a green form of pupa, but I have not encountered it.

Food-plant—Various species of Rutaceae, including *Citrus* spp.

Described from a larva found at Tukdah (5,000 ft., Darjeeling District) 2-xi-45, pupated 12-xi-45 and a male emerged 17-ii-46.

Papilio polyctor Bsd., *ganesa* Dbl.

3rd instar—Head green. Body green, the 5th and 6th somites suffused laterally with white. A white sublateral line from the 5th somite backwards. 1st somite with a green subdorsal spine, 11th and 12th somites also with subdorsal spines, that on the 11th somite very small. 3rd and 4th somites somewhat swollen, the swollen part with a transverse series of six small green points anteriorly and four posteriorly. 8th, 9th and 10th somites each with a bright blue, subdorsal dot. Legs, prolegs and venter glaucous green. Osmeterium yellow. When alarmed, the larva raises and inflates the forepart of the body.

4th instar—Similar. The spines on the 1st and 12th somites smaller, that on the 11th obsolete.

Final instar—Head green. Body green, heavily speckled with paler green. First four somites scutellated and suffused with blackish dorsally, the shield outlined in front and below by a blackish line. 2nd somite with two transverse black lines, the area above the lateral black line outlining the shield pale green. 3rd somite with a lateral ocellus consisting of a black spot with a white streak in the upper half. The skin between the 4th and 5th somites black, but only visible when the larva is extended. 5th somite backwards with a white sublateral stripe. An oblique stripe of darker green starting on the lateral area of the 7th somite, and joining the sublateral stripe, and continuing onto the subdorsal area of the 8th somite. Similar lateral stripes on the 9th, 10th and 11th somites. 9th and 10th somites suffused dorsally with blackish. 7th to 10th somites each with a bright blue, subdorsal dot. 12th somite with a transverse black line, behind which the ground colour is whitish green. 12th somite with minute yellowish subdorsal tubercles. Legs, prolegs and venter pale green. Osmeterium yellow. Spiracles buff rimmed with black.

Pupa suspended by a girdle and tail pad of white silk. Head produced in front into two triangular points, the inner edge slightly dentate. Outline of the thorax narrower in front, broader behind, the sides straight, but slightly inclined, in front, and slightly curved and almost parallel behind, slightly indented where the girdle passes. Abdomen widest across the 3rd somite, the outline slightly curved in front, then straight and inclined to the cremaster. A very slight thoracic keel. Colour pinkish brown, a purplish brown dorsal stripe and a purplish brown subdorsal and lateral stripe on the abdominal somites. Venter and wing cases rather yellower brown. Another example had the ground colour purplish brown, the markings similar to the first but in a darker purple brown.

Food-plant—*Citrus* spp. and other Rutaceae.

Described from a larva found at Tukdah (5,000 ft., Darjeeling District) 23-x-45, pupated 11-xi-45 and a male emerged 11-ii-46.

I can trace no description of the larva of this subspecies, but the following are references to descriptions of the larva of the nomino-typical one:—

Mackinnon & de N., *Journ., Bomb. Nat. Hist. Soc.*, xi, 594, pl. W, figs. 24a—24c. 1898.

Moore, *Lep. Ind.*, vi, 51, pl. 485, figs. 1, 1a, 1b. 1903.

Bingham, *Fauna Brit. Ind.*, Butterflies, ii, 83. 1907.

Jordan, *Seitz Indo-Austr. Rhop.*, ix, 79. 1909.

Talbot, *Fauna Brit. Ind.*, Butterflies, i (2nd edit.), 145. 1939.

Bingham gives the following description, quoted from Moore:—'Larva dull green with some yellowish markings, thorax with a remarkable shield-like covering projecting a little over the head and marked with slender involute black lines; 7th to the 12th segments with lateral obliquely placed pale yellowish lines. Pupa pale green with yellow and white markings. Head cleft, back strongly arched; "sides flattened out with a hard sharp ridge running longitudinally round the whole insect".' Talbot quotes Jordan as follows:—'The young larva bears spines which disappear in the later stages, and is very dark. In the half-grown and full-grown larvae, which are green, the thorax is thickened above like a shield; the margins of the shield and also four oblique stripes on the abdomen are yellowish-grey, a longitudinal line above the prolegs is white. Pupa bluish-green, usually with brown markings, the lateral keel very distinct, brown or white, the horns on the head almost as long as they are broad at the base, the thoracic horns broad, low, pointed.'

Papilio paris L., *paris*.

3rd instar—Head green. Body green, frosted with white, particularly on the lateral area of the 5th and 6th somites. A white sublateral stripe from the 6th somite backwards. 1st somite with a subdorsal green spine. 2nd to 4th somites swollen and expanded into a shield, 2nd somite with a transverse series of four minute points, 3rd somite with six, and 4th with four. 11th somite with a minute yellow subdorsal spine, 12th somite with a larger yellow subdorsal spine. Legs green. Prolegs whitish green. Venter green on first four somites, whitish thereafter. Osmeterium deep chrome. Usually rests with the forepart of the body raised.

4th instar—Similar, but the spine on the 11th somite still further reduced.

Final instar—Head green. Body green, the 4th somite backwards speckled with yellow. First four somites forming a shield, outlined below by a yellow line and with four lilac spots on the posterior margin. The thoracic somites with a series of slightly oblique, longitudinal, wavy, fine, black lines, with occasional flecks of lilac among them. 3rd somite with a lateral ocellus consisting of a terra-cotta spot with a white streak in the upper half. The skin between the 4th and 5th somites velvety black, but only visible when the larva is extended. 5th to 11th somites with a sublateral yellow stripe. 12th somite with a transverse yellow line, behind which the ground colour is whitish green. Legs, prolegs and venter pale green. Spiracles white, the rims black. Osmeterium deep chrome yellow.

Pupa suspended by a girdle and tail pad of white silk. Head produced in front into two triangular points, the inner edge slightly dentate. The thorax narrower in front than behind, the sides straight, but slightly indented by the girdle. Abdomen widest across the 3rd somite, the outline rounded to the 3rd somite and then straight, and tapering, to the cremaster. A very slight thoracic keel. In profile, the wing cases are slightly rounded ventrally. Colour pale yellow green, dotted indistinctly with darker. A dorsal stripe, purplish on the thorax and white on the abdomen. 4th abdominal somite with a purplish subdorsal speck. Venter and wing cases paler, rather chalky green.

Food-plant—*Citrus* spp., and probably other Rutaceae.

Described from a larva found at Tukdah (5,000 ft., Darjeeling District) 10-x-45, pupated 7-xi-45 and a female emerged 17-ii-46.

Talbot (1939, *Fauna Brit. Ind.*, Butterflies, i (2nd edit.) 149, pl. 1, figs. 14, 15) figures the early stages of ssp. *tamilana* Moore, and quotes the following description from Bell (1912, *Journ., Bomb. Nat. Hist Soc.*, xxi, 538-44):—Larva—When young it is dark olive-green with ochreous and white markings. In the third instar there is a white subspiracular band from segments 7 to 10 which persists to the final instar. When full grown the larva is bright grass-green, plentifully speckled with yellow; the white lateral band runs from segments 5 and 6 to the anal end, and there is an indication of a yellow diagonal line. Pupa—The curve of the ventral line very strong. Thorax rather short and convex and without apical protuberance; head-points stout and not long, and slightly separated at the base. Wing cases dark glaucous-green, dorsal area light greenish-yellow, ventral surface of abdomen light yellowish-green; a broad yellow dorsal band from the cremaster to segments 4 and 5, continued by a pinky-brown line to segment 2; the dorso-ventral edge yellow; a dark dorso-lateral spot on the centre of segments 3, 5 and 8.'

Papilio arcturus Westw., *arcturus*.

Head green. Body green, the 4th somite backwards heavily speckled with yellow. First four somites forming a shield, outlined laterally by a yellow line and with four mauve spots on the posterior edge. The thoracic somites with a series of fine, wavy, slightly oblique, longitudinal, black lines, with occasional flecks of mauve on them. 3rd somite with a lateral ocellus consisting of a brick-red spot with a whitish streak in the upper half. The skin between the 4th and 5th somite blue-black, but not visible until the body is extended. 5th to 11th somites with a yellow sublateral stripe. 7th somite with an oblique, unspeckled, yellow-edged, green lateral stripe, which is continued onto the subdorsal area of the 8th somite. 9th, 10th and 11th somites each with a similar lateral stripe, decreasing in size from front to rear. 12th somite with a transverse yellow line, the area behind it whitish green. Legs, prolegs and venter pale green. Spiracles white, rimmed with black. Osmeterium yellow.

Pupa suspended by a girdle and tail pad of white silk. The head square in front, very slightly expanded at either side. Mesothorax with the sides almost parallel, prothorax with the sides sloping towards the head. Abdomen widest across the 3rd somite, the sides straight, not curved. Body flattened somewhat above, thorax with a slight keel. In profile, the ventral line of the wing cases slightly curved. Colour purple brown, a darker dorsal stripe. The thorax and 1st to 4th abdominal somites subdorsally suffused with fiery orange. Venter and wing cases greyish brown, slightly mottled with darker.

Food-plant—Rutaceae of various species.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 17-x-45, pupated 22-x-45 and a female emerged 1-iii-46.

Papilio helenus L., *helenus*.

Ovum spherical, the base slightly flattened, very pale yellow. Laid singly on either surface of a leaf of the food-plant, 1st instar—Head black. Body yellowish olive along the dorsum, the lateral area olive. 11th and 12th somites white. A subdorsal series of minute branched spines similar in colour to the somites on which they are placed, the spine on the 1st somite much larger than the others.

2nd instar—Head dark olive. Body olive, the lateral area darker. 1st somite tinged with yellow, a white V-shaped mark, the point on the dorsum of the 8th somite, the arms extending to the lateral area of the 5th. 11th and 12th somites whitish. Spines as in previous instar but smaller.

3rd instar—Very similar to the preceding, but the spines, except on the 1st, 11th and 12th somites, reduced to small warts. 3rd and 4th somites considerably swollen.

4th instar—Similar to the preceding. The swollen portion of the 3rd and 4th somites more evident and with four small blue dots on the anterior and posterior margins. 8th somite with a subdorsal and a lateral, 9th somite with a subdorsal, small blue dot. Dorsum with a series of faintly white-outlined diamond-shaped marks. A white sublateral stripe from the 6th somite backwards. Osmeterium purplish. Towards the end of the instar, the ground colour becomes much greener.

Final instar—Head pale olive green. Body bright grass-green. 3rd somite with a lateral ocellus consisting of an olive spot containing a black dot with a black crescent below it and two white specks above. The ocelli joined by a double band of conjoined black rings. Posterior edge of the 4th somite with a very wavy lavender line, the area behind the line brown and shading into the black of the skin between the 4th and 5th somites, the black area only visible when the larva is extended. The sublateral area of the 1st to 6th somites brownish grey, shading into the pale grey of the median area of the venter. A sublateral white stripe from the 6th somite backwards. An oblique, blackish, or dark brown, stripe, minutely streaked with lavender, joining the sublateral stripe on the 7th somite and continuing almost to the dorsum of the 8th somite. 9th somite with a similarly coloured triangular lateral patch and a subdorsal spot, in some examples the lateral patch and subdorsal spot are joined. A transverse white line on the 12th somite, joining the sublateral stripe on the 11th, behind this line the ground colour is whitish with an anterior transverse series of blackish spots. Legs yellowish green. 1st pair of prolegs blackish, the others white with three horizontal black lines. Venter from 7th somite backwards whitish. Subdorsal tubercles on the 1st somite green, on the 12th somite white and extremely minute. Spiracles ochreous. Osmeterium deep crimson.

Pupa suspended by a girdle and tail pad of black silk. Mottled brown, a white dorsal patch on the prothorax, a white subdorsal spot on the meso-thorax, a white dorsal stripe on the abdominal somites, much broader from the 5th somite back, and a white subdorsal spot on the 3rd abdominal somite. The head produced into a pair of slightly back-curved, dentate processes. Meso-thorax with a slight double keel rising to a single point anteriorly. The first four abdominal somites flattened and expanded laterally. 4th to 6th abdominal somites with a double dorsal and a subdorsal tubercle, decreasing in size from front to rear. The expanded portion of the 1st to 4th abdominal somites, the cephalic horns and the basal half of the wing cases, very much darker brown than the rest of the body. The fore-part of the body bent back at such an angle that, when the pupa is formed on a vertical object, the frontal portion is at a slight angle below the horizontal. Another form of pupa is bright, mottled green with a brown speck at the base of the wing case and another subdorsally on the 1st abdominal somite. Abdominal somites with a bright yellow-green triangular subdorsal patch. Wing cases and venter mottled with whitish.

Food-plant—*Citrus* spp. and other Rutaceae.

Described from a number of larvae found at Tukdah (5,000 ft., Darjeeling District), one of which pupated 25-ix-45 and a male emerged 16-x-45.

Talbot (1939, *Fauna Brit. Ind.*, Butterflies, i (2nd edit.), 169, pl. 1, figs. 16, 17) figures the early stages of ssp. *daksha* Hamps. and quotes a description by Bell (1911, *Journ., Bomb. Nat. Hist. Soc.*, xx, 1117). In this description the osmeterium is stated to be deep flesh colour, and the brown form of pupa 'may be variegated with brown and pink, black and grey, white and green all together without a yellow saddle.' I found that my brown pupae, some twenty or more, were extremely constant, much more so than the corresponding form of *P. demoleus* L. for example, and the only variation was a very slight difference in the depth of colour.

HETEROCERA.

LYMANTRIIDAE:

Dasychira tenebrosa Wlk.

Head dark brown, the mouth parts paler, and with a pale line along the median suture. Body black, the dorsum of the 9th and 10th somites speckled minutely with white. 1st somite with a black subdorsal tubercle, emitting a fan-shaped tuft of longish black hair. 2nd and 3rd somites with subdorsal, lateral and sublateral black warts tufted with plumose brown hair. 4th to 7th somites with a very wide dorsal brush of dark golden brown hair, the centre of these brushes looking like seal-skin, a smaller subdorsal brush mixed with long black hair, and a lateral and sublateral black wart tufted with plumose brown hair. 8th to 10th somites each with a subdorsal, lateral and sublateral black wart tufted with plumose brown hair, and with a small brush of dark golden brown hair immediately below the subdorsal tuft. 11th somite similar with an additional wide dorsal brush of dark golden brown hair. 12th somite with a fringe of long black hair and a subdorsal brush of short, dark golden brown hair. Dorsal glands blackish. Venter black. Legs and prolegs pale pink.

Pupa in a cocoon of dense brown silk, mixed with larval hair. Pale brown, the intersegmental rings darker, the venter paler.

Thorax and abdomen dorsally clothed sparsely with longish brown hair.

Food-plant—Vine, Virginia Creeper.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 10-xi-45, spun 10-xi-45 and a female emerged 11-xii-45.

Dasychira feminula Hamps.

Head dark, velvety grey. Body black, a pale dorsal line on the thoracic somites and a chestnut dorsal line, white intersegmentally, from the 8th to 11th somite. 9th and 10th somites sprinkled with white dots dorsally. 1st somite with a black subdorsal tubercle, emitting a forward-directed tuft of black hair of varying lengths. 2nd and 3rd somites with a subdorsal, lateral and sublateral black wart, tufted with blackish hair, 3rd somite, in addition, with a long, white, plumose, subdorsal and lateral hair. 4th to 7th somites with a very broad dorsal brush of short golden-brown hair, a subdorsal brush of short red-brown hair and a lateral and sublateral tuft of longish black hair arising from black warts. 5th somite with a lateral, and 6th with a subdorsal, long plumose white hair in addition. 8th to 10th somites each with a subdorsal, lateral and sublateral black wart, tufted with longish black hair. The 9th somite with an additional long white plumose subdorsal hair. 11th somite with a large dorsal brush of short reddish-brown hair, a subdorsal, lateral and sublateral black wart tufted with longish black hair and a long white plumose subdorsal and sublateral hair in addition. 12th somite with a backward-directed fringe of long blackish hair. Venter black. Legs black. Prolegs black with grey feet. Dorsal glands blackish.

Pupa in a cocoon of dense golden brown silk mixed with larval hair. The cocoon broader in front than behind. Pupa olive brown, the intersegmental areas paler. Except for the wing cases; clothed with tufts of short brown hair. Cremaster a stout spike armed with a large bunch of hooked spines at the tip.

Food-plant—Vine, Virginia Creeper.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 25-ix-45, spun 4-x-45 and a female emerged 22-x-45.

This species has been provisionally determined as the above by the British Museum (Natural History), but it is impossible to be definite as no male is available.

Leucoma (*Caragola*) *ochripes* Moore.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xliv, 80. 1943.

Another form of the larva has the head pale chestnut. Ground colour of body yellowish chestnut transversely streaked with bluish grey, the streaking more pronounced between the somites. The paired dorsal brushes on the 4th and 5th somites composed of dark golden brown hairs, the dorsal tufts on the 11th somite composed of short yellowish hair. All the other warts brown and tufted with sparse pale brown hair. Legs and prolegs pale yellowish chestnut. Venter as dorsum but slightly paler.

Described from a full fed larva found in Shillong 20-iv-41, pupated 25-iv-41 and a male emerged 12-v-41.

Leucoma (*Caragola*) *sericea* Moore.

Head yellow. Body greenish yellow. An indistinct lateral stripe composed of black specks. 1st somite with black subdorsal tubercles tufted with whitish hair and a pair of black dorsal dots. 2nd to 11th somites each with a blue-black subdorsal spot bearing sparse white bristles, the spots on the 4th, 5th and 10th somites more prominent. A lateral series of pale-haired, yellowish green warts. 4th and 5th somites with small dorsal tufts of very short white hair. Dorsal glands white. Legs, prolegs and venter pale greenish yellow. The larva is gregarious.

Pupa in a few netted silk threads. Greenish white, the dorsum brownish grey tinged with olive and with a series of transverse black lines. An irregular, chestnut, lateral patch, edged with black, on the 6th abdominal somite. Wing cases partly black-veined. Head and thorax with longish black hair dorsally and white laterally. Abdomen with longish white hair.

Described from a full fed larva found in Shillong 21-iv-41, pupated 25-iv-41 and a male emerged 7-v-41.

LASIOCAMPIDAE :

Paralebeda plagifera Wlk.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xlvi, 266. 1946.

Ovum—Egg-shaped, bluish white, the micropyle a dark speck. Laid in a line on a leaf, lying side by side.

Half grown larva—Head blue grey, reticulated with paler laterally, an inverted pale Y-shaped mark, the tail edged with black and with a black line from the vertex to outside the jaws, labrum whitish. Body blue grey. 1st somite with a dorsal and subdorsal, pale-edged, blackish line, and with a black spot between the two anteriorly. 2nd to 10th somites with a double white subdorsal line, the dorsal area on these somites blackish with a series of small whitish Y-shaped marks and transverse orange bars. Lateral area purple grey, suffused with blackish on the 3rd, 4th, 7th, 8th, 11th and 12th somites. A sublateral series of tubercles bearing pale hairs, the tubercle on the 1st somite double, on the 1st to 3rd larger than the others and with the hair longer. 2nd and 3rd somites with a transverse tuft of rufous hair dorsally. 11th somite with a dorsal tubercle covered with short rufous hair. The dorsal area generally with sparse black hairs. Venter black with transverse yellow streaks laterally. Legs brown. Prolegs dark grey.

Described from larvae bred in Tukdah (5,000 ft., Darjeeling District) in October 1945.

DREPANIDAE :

Callidrepana obliquistriga Warr.

Head black, outlined with a grey V frontally, bifid above. Body black, a pair of small brown dorsal tubercles on the 1st somite. 2nd and 3rd somites with a small trifid corneous lateral process. 5th somite with a brown dorsal blotch. A double series of very minute dorsal tubercles. 12th somite tapered, the anal claspers replaced by a medium-length spine, the base olive, the apex black, the two parts separated by a white ring. Legs, prolegs and venter black. A small evertible gland outside the first pair of legs, I have never seen this everted in nature, but it is revealed when a larva is 'blown'. In the earlier instars the larva is entirely black and closely resembles a piece of snail excrement.

Pupa formed on a pad of blackish silk spun on a leaf, with a few strands of silk spun across the end of the abdomen. Colour blackish brown, the meso-thorax with a highly polished patch on either side. The head truncate, the thorax very slightly keeled, and with a projecting point at the origin of the wing case. 2nd to 4th abdominal somites with a pronounced dorsal keel. Spiracles raised. Venter and wing cases reddish-chestnut.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 2-x-45, pupated 8-x-45 and a female emerged 20-x-45.

Thymistada tripunctata Wlk.

Pupa under a slight web on a folded leaf. Colour pale brown, the ventral area paler, the wing cases whitish. A triangular, white, mealy, dorsal patch extending from the prothorax to the 4th abdominal somite, a round spot on the meso-thorax devoid of this meal. Spiracles slightly raised and set in fawn spots.

Described from a pupa found at Tukdah (5,000 ft., Darjeeling District) 19-x-45, from which a female emerged 30-x-45.

The determination is not absolutely definite as no male was available.

SATURNIIDAE :

Loepa katinka Westw.

Hamps., *Fauna Brit. Ind.*, Moths, i, 25. 1892.
Seitz, *Seitz Indo-Austr. Bombyces*, x, 506. 1928.

Young larva—Head black and shining. Body black. 2nd to 4th somites much swollen and with a lateral black, a subdorsal and two dorsal chestnut warts emitting a few long hairs. 5th to 9th somites each with a smaller lateral and subdorsal blackish wart, 10th with a lateral black and a subdorsal chestnut wart, 11th and 12th with both lateral and subdorsal warts chestnut, all bearing a few long hairs. A subdorsal yellow spot on the 4th somite and a lateral series of greenish yellow spots on the 5th to 10th somites. Legs, abdominal prolegs and venter black. Anal flap and claspers chestnut.

Adult larva—Head very dark brown, almost black, shining. Body velvety, dark nigger brown, almost black. 1st somite with a whitish dorsal line. 3rd and 4th somites with a white lateral dot. 4th somite with a bright, pale green, subdorsal spot. 5th to 10th somites each with a bright, pale green, lateral patch, those on the 6th to 9th somites roughly triangular in shape, that on the 10th a filled-in V with a small spot below. 11th somite with two dots only. 1st to 11th somites each with a transverse series of six black tubercles, armed with black, urticating bristles. 12th somite with four tubercles only. Clothed, particularly on the first four somites, with medium length, bristly, rufous hairs. 4th somite produced laterally into a triangular lobe. Legs black. Venter and prolegs black and clad with sparse, single, pale hairs. Rests with the forepart of the body held erect.

Pupa in a hammock-shaped cocoon of tough, rather papery, semi-translucent, golden to dark brown silk. Olive brown, the abdominal somites tinged with orange and with an olive dorsal stripe. Cuticle of the wing cases slightly wrinkled, on the abdomen with very fine transverse lines. Prothorax with a dorsal ridge. Cremaster with a conical lateral point, the area between filled in with hooked spines.

Food-plant—*Impatiens* sp., *Polygonum* sp., *Ampelopsis* sp.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 25-ix-45, spun 8-x-45 and a male emerged 10-iii-46.

Hampson's description is as follows:—'Brown and hairy, with six pink tubercles on each somite; white sublateral irregular blotches from 4th to 10th somites; claspers pink.' Seitz writes 'the larva with 6 rows of small red tubercles exhibiting small thorns; ground colour brown, shaded with dark. The cones are purple red, below them sulphur-coloured lateral spots; on Cissus and Leea, probably also on vine; it pupates in a blue-green or brownish cocoon tapering on (sic) both ends'.

SPHINGIDAE :

Panacra metallica Btlr., *metallica*.

Ovum—Milky white tinged with green, ovoid. Laid singly on the under, rarely on the upper, surface of a leaf of the food-plant. Hatched 24-v-44.

1st instar—Head and body pale greenish white. A pinkish dorsal stripe. Horn black, straight, rather stout, the tip bifid. After feeding, the body becomes greener. Moulted 28-v-44.

2nd instar—Similar, with traces of a black dorsal line replacing the pink stripe. Very long and thin. Horn proportionately longer and stouter. Moulted 1-vi-44.

3rd instar—Similar, the black dorsal line prominent. 4th somite with an oval black subdorsal spot with a white crescent below. Horn black above, grey below. Moulted 4-vi-44.

4th instar—Similar. The ocellus slightly raised and with a few black streaks in front and behind. Horn disproportionately thick, curved, the underside pale brown. The whole body very shiny. Moulted 8-vi-44.

Final instar—Head green. Body green, speckled with paler along the secondary segmental rings, shiny. A black-brown dorsal stripe with a black median line from 5th somite to base of horn. Thoracic somites with a subdorsal brown stripe, with a zig-zag, blackish line above and below on the 2nd and 3rd somites, and a blackish dorsal line. 4th somite with a large black-brown dorsal blotch extending down to the lateral area. The ocellus on the 4th somite consisting of a large black spot with two white specks above it and a dark red-brown crescent edged with golden brown below. A lateral series of black-brown blotches from the 5th to 11th somite, the blotches degenerating into a number of spots posteriorly on each somite. An interrupted black-brown sublateral stripe, most marked at the base of the legs and prolegs. Legs pink. Prolegs olive. Horn erect and curved backwards and downwards, olive. A triangular blotch from the base of the horn to the anterior edge of the anal claspers, and the anal flap olive, edged anteriorly with a black-brown stripe. Spiracles dark brown, the ends white, a central stripe white. Prior to pupation subdorsal patches of brown dots appear on the 5th to 10th somites. Pupated 17-vi-44.

Pupa in a slight web among litter. Dull green, traces of a purplish dorsal and subdorsal stripe on the abdominal somites. The anterior half of the abdominal somites suffused with purple and streaked longitudinally with buff. Wing cases speckled with black along the veins. Proboscis sheath expanded slightly frontally and ventrally. Eye brown. Cremaster excavate below and ending in a bunch of hooked spines.

Food-plant—Arums of various species.

Described from larvae bred from ova found at Tukdah (5,000 ft., Darjeeling District). All the pupae obtained in 1944 died on being taken down to Calcutta, but further larvae were found in September 1945, one of which pupated 6-x-45 and a female emerged 24-i-46.

Bell & Scott (1937, *Fauna Brit. Ind.*, Moths, v, 310, pl. iv, fig. 8, pl. xiv, figs. 12, 13) describe and figure the early stages of the subspecies *anfracta* Gehlen., from Mussooree and Simla, which appear to be indistinguishable from those of the present subspecies. They remark, however, that there is only one brood in the monsoon months. In Tukdah there seem to be at least two broods, as ova and young larvae were found in May and June, and again in September.

Theretra alecto L., *alecto*.

Moore, *Cat. Lep. Ins. Mus. E.I.C.*, i, 275, pl. x, figs. 4, 4a. 1857.

Butl., *Proc. Zool. Soc.*, 411, pl. 39, fig. 8. 1880.

Hamps., *Fauna Brit. Ind.*, Moths, i, 85. 1892.

Mell, *Biol. u. System. der Sudchin. Sphing.*, 299, pl. x, figs. 22-28, pl. xix, figs. 5, 6. 1922.

Seitz, *Seitz Indo-Austr. Bombyces*, x, 566. 1929.

Bell & Scott, *Fauna Brit. Ind.*, Moths, v, 441, pl. v, figs. 21-23, pl. xii, fig. 6. 1937.

2nd instar—Head and body yellow green. 4th to 10th somites each with a subdorsal ocellus consisting of a white spot containing a black dot at the top, and decreasing in size from front to rear. Legs and prolegs yellow green. Horn black with the base orange, long, thin, straight, the tip bifid. Moulted 25-ix-45. One example was pink slightly tinged with green.

3rd instar—Very similar to the preceding. A black dorsal line on the thoracic somites, continuing to the base of the horn as a faint bluish line, most noticeable on the 4th somite. Ocelli consisting of a white spot ringed with black and containing a lavender spot at the top, the ocellus on the 4th somite with the iris bluish. The pink form with the white of the ocellus flushed with pink. A pale subdorsal line joining the ocelli and joining the base of the horn. Spiracles black. Horn very long, slightly up-curved, the tip bifid, thin, black with the base orange. Moulted 29-ix-45.

4th instar—Very similar to the preceding, the body minutely speckled with paler. The ocellus on the 4th somite pale yellow ringed with black, with a black pupil in the upper half, convex above and almost straight below, those on the 5th to 10th somites pale cream ringed with black, round, the upper third and extreme lower portion pale lavender. Legs pink. Spiracles bluish edged with black. Moulted 6-x-45. The pink form now cinnamon coloured, 11th somite with the area between the subdorsal stripes dark brown.

Final instar—Brown form—Head pinkish brown. The first four somites with the dorsum orange brown with a black-brown dorsal line. Thoracic somites with a dark brown subdorsal stripe edged below with orange brown, the lateral area of these and the 4th somite dark brown. 5th somite backwards with the dorsal area dark brown speckled with yellow, a dark dorsal line and an indistinct dark subdorsal stripe between the ocelli. The area below the subdorsal stripe rather more pink with a series of six dark brown oblique lateral stripes, the last one reaching the base of the horn and with a yellow bar edging it above on the 11th somite. A subdorsal series of ocelli from the 4th to 10th somites, almost round, the upper edge slightly more convex. That on the 4th somite consisting of a black ring enclosing a large black pupil, edged below by a crescent-shaped mark, yellow above, then white and finally very narrowly lavender; the other ocelli consisting of a black ring with a purple-brown spot in the upper portion, a yellowish transverse bar with a narrow lavender band below. Venter dark brown on the first four somites, coloured as the lateral area thereafter. Legs dark plum banded with paler. Prolegs, anal flap and claspers brown slightly tinged with olive. Spiracles grey blue. Horn short, stout, downcurved, deep plum colour. Pupated 22-x-45. No larvae remained green in the final instar.

Pupa in a slight web among litter. Meso-thorax and abdomen pale chestnut, the sides of the thorax streaked and suffused with blackish, a dark dorsal stripe on the abdomen. Ventral surface of abdomen and lateral area pinkish streaked with black, the anterior portion of each somite chestnut. Wing cases blackish with some pale greenish-buff streaks on the disc, and with a broad greenish-buff stripe between them and encroaching onto the costa. Proboscis sheath projecting forward and ventrally, the projecting portion blackish and ridged. Eye greenish-buff with a black crescent anteriorly and a blackish spot posteriorly. Cremaster black, triangular, the tip bifid. Spiracles black. A male emerged 10-iii-46.

Food-plant—Vine.

Described from larvae found at Tukdah (5,000 ft., Darjeeling District).

Hampson's description is as follows:—'Green, speckled with yellow; a dorsal green line; a subdorsal yellow stripe and a series of yellow ocelli with green centres on fourth to eleventh somites, decreasing in size posteriorly.' Seitz writes: 'Larva varying from green to brown; on the sides of the rings 4 to 10 there are dark eye-spots surrounded by yellow; that on the 4th ring hardly differs in the somewhat deeper colouring, sometimes not at all, and it by no means represents such a deceptive snake's eye as in *latreilli;* on vine, moreover on Paederia, Psychotria and Morinda; more rarely on Euphorbiacea Glochidion. Pupa slender, 6 to 8 cm. long, with a proboscis-case being raised like a beak, though not forming a nose, earth-grey with bone-coloured eyes.' Bell & Scott give *Dillenia indica, Saurauja nepalensis, Vitis, Leea, Psychotria* and *Rubia cordifolia* as food-plants.

Rhagastis aurifera Btlr., *aurifera.*

Seitz, *Seitz Indo-Austr. Bombyces,* x, 471. 1929.

Bell & Scott, *Fauna Brit. Ind.,* Moths, v, 471, pl. vi, figs. 15, 16. 1937.

Ovum—Bright jade green, a broad ovoid. Laid singly on the underside of a leaf of the food-plant.

1st instar—Head yellowish green. Body yellow green, becoming greener after feeding. Horn straight, black, of medium length, the tip bifid.

2nd instar—Head green. Body green dotted with white along the secondary segmental divisions. 4th somite with a subdorsal ocellus consisting of a dark blue spot in a white ring. A dark dorsal line. Horn black, the base reddish.

3rd instar—Very similar. A white subdorsal stripe on the thoracic somites. Ocellus with the pupil dark blue anteriorly shading into green posteriorly and ringed broadly with white and narrowly with black. A series of indistinct white, oblique, lateral stripes from the 5th somite backwards.

4th somite—Head green. Body green, speckled with white along the secondary segmental divisions. A dark green dorsal line, broadly edged with whitish from the 6th somite backwards. Thoracic somites with a white subdorsal line, edged above with darker green. Ocellus on the 4th somite and posterior portion of the 3rd, consisting of a sap green ring edged internally with yellow, enclosing the pupil, which is dark blue anteriorly, shading through paler blue to green posteriorly, the green portion with one or two large and a number of small white dots. The dorsum between the ocelli yellow. A series of indistinct oblique lateral stripes from the 5th somite backwards, consisting of large bluish white dots, the stripe from the 9th somite continuing to the base of the horn as a solid, clear white stripe. 5th somite backwards with a subdorsal series of lunules composed of white dots. Sublateral and ventral areas thickly speckled with bluish white dots. Legs pink, the joints yellow. Prolegs green. Horn pale purple brown above, with a dorsal blackish line, shading into yellow below, the tip blackish blue. Spiracles white ringed with green. Thoracic somites tapered.

Final instar—Green form—Head green. Body green. A dorsal line from the head to the base of the horn blackish on the thoracic somites and very dark green thereafter. Thoracic somites with a white subdorsal line. A subdorsal ocellus on the posterior portion of the 3rd and anterior portion of the 4th somites, consisting of a dark olive ring, edged internally with pale yellow and enclosing a pupil, the anterior portion very dark blue, shading into paler outwardly and into blue green posteriorly, the blue green portion with a few large and small white dots in it. The dorsum between the ocelli bright yellow. 5th to 9th somites each with a subdorsal lunule composed of white dots and with two further white dots between the lunule and the dorsal line, 10th somite with the two dots but without the lunule. 5th somite backwards with the dorsal line broadly and diffusely bordered with whitish. 5th to 8th somite each with an oblique lateral stripe composed of white dots, 9th somite with a more solid stripe, which is continued to the base of the horn. The whole of the lateral area from the 5th somite backwards minutely white-speckled, the dorsal area faintly white-speckled along the secondary segmental rings. Legs pink. Prolegs green. Horn brownish-purple, downcurved and minutely tuberculate, flattened slightly from side to side. Spiracles white with a blackish speck at each end.

Brown form—Head olive green. Body golden brown. A very dark olive dorsal line from head to base of horn. Thoracic somites with a white subdorsal line, edged above with darker golden brown. The ocellus consisting of a white ring enclosing a pupil of which the anterior portion is black, the posterior olive with two large and a number of smaller white dots, the white ring edged below and anteriorly narrowly with blackish, above widely with olive. A yellow dorsal patch between the ocelli. Subdorsal lunules and lateral stripes similar to the green form, but the posterior stripe edged above with olive brown, the area behind it thickly speckled with pinkish white. Legs deep pink. Prolegs olive speckled with pinkish. Horn olive brown, with a black line and white speckling along the upper edge, the tip bluish. Anal flap and claspers pale olive brown. Spiracles white with a black speck at each end.

Pupa in a slight web among litter. Head, thorax and wing cases dark olive brown, almost black. Eye whitish, reticulated with purple brown. Leg sheaths and veins of the wing cases with raised black points. Abdomen with a broad buff dorsal stripe with a median blackish line, and minutely speckled with white and blackish. Subdorsal and lateral areas blackish with a series of white, roughly X-shaped marks above and below the spiracles. Venter with a black interrupted median line, a broad whitish median stripe minutely speckled with greyish, a narrow, dark chestnut, submedian stripe and a broad blackish lateral stripe. Cremaster black, triangular, terminating in a double bifid spine and with three spines on either edge, below deeply and narrowly excavate. Proboscis sheath projecting frontally and very slightly ventrally. Very much more slender than the pupa of *R. confusa* Roths. & Jord.

Food-plant—Virginia Creeper.

Described from larvae found at Tukdah (5,000 ft. Darjeeling District), one of which pupated 29.xi.45 and a male emerged 20.xii.45.

Seitz describes the larva as 'green', in the sides the oblique stripes are so broad that their white colour predominates; the sham-eye on the 4th ring is large; horn graphite-grey, very thick; probably on *Polygonum japonicum.*'

Rhagastis confusa Roths. & Jord.

Bell & Scott, *Fauna Brit. Ind.*, Moths, v, 474, pl. vi, fig. 19, pl. xv, figs. 9, 10. 1937.

2nd instar—Head bright green. Body bluish green, speckled with minute white dots along the secondary segmental divisions. A dark dorsal line. Thoracic somites with a yellowish subdorsal line. A subdorsal ocellus on the posterior portion of the 3rd and anterior portion of the 4th somite, consisting of a dark green ring, edged internally with yellow, enclosing a spot, dark blue anteriorly shading through bright blue into green posteriorly. Traces of oblique lateral white stripes. Horn long, black, the base deep red, the tip bifid. 4th somite very swollen, the thoracic somites tapered. Moulted 15.x.45.

3rd instar—Similar. The lateral stripes more pronounced, that on the 9th somite most distinct and reaching the base of the horn. Moulted 21-x-45.

4th instar—Similar. The legs pink. The horn stouter, pale purple with minute black tubercles. The dorsal line edged broadly and indistinctly with bluish white from the 8th somite backwards. Moulted 28-x-45.

Final instar—Head green. Body green, a darker green dorsal line from head to base of horn, thoracic somites with a yellowish subdorsal stripe edged above with darker green. The body, particularly from the 5th somite backwards, heavily speckled along the secondary segmental rings with white. The dorsal line broadly bordered with bluish white from the 7th somite backwards. A subdorsal ocellus on the 4th and posterior edge of the 3rd somite, consisting of a cream ring, broad above and narrow elsewhere, outlined with dark green and tinged above and below with dark blue, enclosing a pupil, the anterior portion very dark blue, the posterior green containing a few white dots. 5th to 8th somites each with a subdorsal lunule composed of bluish white dots, 6th to 10th somites each with a bluish white lateral stripe, which joins the lunule on the somite behind, the stripe from the 9th somite continued to the base of the horn and edged above with dark green. Legs pink. Venter and prolegs green, the former dotted with white. Horn stoutish, slightly down-curved, evenly tapering, pale purple. Spiracles white with a central blackish-brown dot. Pupated 7-xi-45.

Pupa in a slight web among litter. Head and thorax blackish brown. Wing cases brown, the inner margin darker, the veins with raised black points. Legs sheaths with raised black points. Abdomen pale fawn, a blackish dorsal and wide subdorsal stripe consisting of short, longitudinal streaks. A blackish spiracular stripe and a broad ventro-lateral stripe, also composed of short streaks, and a black median line. Spiracles set in black patches. Cremaster black, triangular and ending in two double spines, underside excavate. Proboscis sheath projecting very slightly frontally and ventrally. Eye brown with a pale crescent. A male emerged 7-iii-46.

Food-plant—Virginia Creeper.

Described from larvae found at Tukdah (5,000 ft., Darjeeling District).

Cechenena lineosa Wlk., *lineosa*.

Mell, *Biol. u. System. der Sudchin. Sphing.*, 330, pl. 19, figs. 34, 35, pl. 32, fig. 13. 1922.

Seitz, *Seitz Indo-Austr. Bombyces,* x, 570. 1929.

Bell & Scott, *Fauna Brit. Ind.*, Moths, v, 491, pl. vii, fig. 7. 1937.

Head dark olive brown. Body pinkish brown, minutely speckled with paler along the secondary segmental divisions. First four somites with a blackish dorsal line and a darker brown subdorsal stripe, edged below with paler. 5th to 11th somites with a slightly zig-zag dark subdorsal stripe, edged below with paler and joining the base of the horn. 3rd to 10th somites each with two whitish subdorsal dots with a black dot adjoining above. 4th to 10th somites each with a dark oblique lateral stripe edged below with paler. A subdorsal ocellus on the 4th somite consisting of a large black spot edged behind by a yellow crescent streaked and speckled with brown, the whole enclosed in a black ring. Legs brownish pink, the joints paler. Prolegs pinkish brown dotted with paler. Anal flap and claspers dark brown. Venter pinkish brown, minutely dotted with paler. Spiracles dark brown, the ends whitish. Horn olive brown, the base rather bulbous, then narrowing, the tip again bulbous and slightly expanded, the whole compressed slightly from side to side, the upper surface minutely tuberculate, the sides with fine longitudinal ridges.

Pupa in a slight web among litter. Head, thorax and wing cases dark brown, the thorax with a paler dorsal patch. Wing cases with lines of black points on the veins. Abdomen ochreous brown, a dark dorsal stripe and a broad greyish lateral stripe with minute, longitudinal, ochreous streaks. Venter pale ochreous brown, a dark median line, a dark sub-median and a wide lateral stripe. Cremaster triangular, black, excavate below, with two subdorsal spines and a double terminal spine with a branch laterally at right-angles, the whole rugose. Proboscis sheath dark brown, projecting very far forward and, in profile, shaped something like a duck's bill as seen from above.

Food-plant—*Polygonum* sp. Bell & Scott give *Saurauja tristula, Vitis*, *Impatiens* and *Polygonum chinensis.*

Described from a full fed larva found in Tukdah (5,000 ft., Darjeeling District) 7-xi-45, pupated 23-xi-45 and a male emerged 17-iii-46.

Seitz' description is as follows:—'Larva chocolate brown with a large sham-eye squinting forward and a reticular marking similar to the skin of a snake, the longitudinal and oblique stripes being indistinct.' Bell & Scott's figure shews a very much brighter larva than mine.

NOCTUIDAE:

Eriopus (*Callopistria*) *repleta* Wlk.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.,* xlvii, 37. 1947.

Immature larva—Head green, broadly outlined with black. Body green with traces of a darker dorsal line. A subdorsal smoky stripe, edged below by a whitish stripe. 11th somite very slightly swollen dorsally, and it and the 12th somite slightly suffused with smoky dorsally. Area below the whitish stripe, legs and prolegs paler green.

Full grown larva—Head green, a black V outlining the clypeus and a blackish line outlining the head itself. Body blue green, a black line dividing the head from the 1st somite. A transverse black dorsal line on the 1st somite. A transverse black dorsal bar, outlined with yellow, on the 2nd, 3rd, 5th, 6th, 7th, 8th, 9th and 11th somites. A dark chocolate spiracular stripe, entire from the 1st to 3rd somites, and broken into slightly curved streaks on the 4th to 11th, these streaks edged faintly above and below with yellowish, and joining a transverse black line, edged above with yellow, on the 12th somite; anteriorly the spiracular stripe joins the line between the head and 1st somite. Legs, prolegs and venter yellower green. Spiracles black.

Pupa in a compact cocoon of tough silk, covered with earth, moss, etc. Pale yellowish chestnut, the intersegmental rings darker. Cremaster armed with two fine spines. The larvae did not pupate for some three months after spinning their cocoons.

Food-plant—Ferns.

Described from larvae found at Tukdah (5,000 ft., Darjeeling District) one of which spun 20-ix-45 and a male emerged 26-i-46.

Although there is a very marked difference between this larva and the one previously described, not only in appearance but also in the life history, and although the imago of the present species is slightly smaller and darker, the Forest Research Institute have determined both as belonging to the same species. The present larva has a very long pre-pupational diapause, some three or four months, versus the three or four days between the spinning of the cocoon and pupation in the other type of larva.

Parallelia (*Ophiusa*) *maturata* Wlk.

Head dark nigger brown, the clypeus filled in with cream with a central black spot and outlined with pink, a pale yellow dot on each side of the median suture just above the apex of the clypeus and a large, pale yellow, lateral patch. Body pale pinkish, the ground colour almost completely hidden by the small specks making up the markings. These consist of three dorsal lines of blackish specks, followed by a broad greyish stripe edged below by a black line, then an olive lateral stripe, a grey sublateral stripe and an olive latero-ventral stripe. 4th somite with a large black subdorsal spot containing a white dot in it above. 11th somite with a pair of dorsal tubercles, red anteriorly and black posteriorly, which are all black in the earlier instars. Venter pinkish with a median and lateral blackish stripe. Legs pink ringed at the joints with yellow. Prolegs blackish, pink internally, with a black spot between each pair, the first pair obsolescent. Anal claspers pinkish minutely speckled with grey.

Pupa in a cocoon of rather gummy silk, spun in a curled leaf. Purple brown, completely covered with a white bloom. Apex of abdomen longitudinally wrinkled and armed with a few longish hooked spines.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 26-ix-45, spun 3-x-45 and a male emerged 28-x-45.

Phytometra (*Plusia*) *tarassota* Hamps.

Head pale green, a few minute black specks emitting fine black bristles and a black lateral stripe. Body pale green. 1st somite with two, 2nd and 3rd somites with one, transverse series of six minute black specks emitting short bristles. A dark dorsal stripe from the 4th somite backwards edged with whitish, a wavy white subdorsal line and a lateral white line broadly edged above with darker green. 4th somite with a black dot immediately above the lateral line, some examples with very minute black dots placed similarly on the other somites. A few white dots on the area below the lateral line. A few fine white hairs arising from white specks. Spiracles black. Legs pale green, tinged with blackish. Prolegs pale green, the first two pairs absent. Shape tapered in front, broad behind.

Pupa in a slight cocoon of white silk spun in a leaf. Thorax dull olive, abdomen chestnut dorsally, the venter and wing cases paler olive. Cremaster a stout spike terminating in a number of hooked spines, and fixed in the silk of the cocoon.

Food-plant—Garden Geranium.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 22-ix-45, pupated 25-ix-45 and a female emerged 7-x-45.

Phytometra (*Plusia*) *albostriata* Brem. & Grey.

Pupa in a hammock-shaped cocoon of thin white silk, spun underneath a slightly folded leaf. Pale green, meso-thorax with an irregular black mark, shaped somewhat like a Scarab beetle, anteriorly and an irregular subdorsal black spot posteriorly. 1st to 6th abdominal somites with a black dorsal blotch, the intersegmental area between the 4th and 5th somites brown dorsally. Cremaster a brown spike armed with minute hooked spines and fixed in the silk of the cocoon.

Described from a pupa found at Tukdah (5,000 ft., Darjeeling District) 19-ix-45, from which a male emerged 26-ix-45.

Sypna latifasciata.

Head yellowish green. Body green, the 1st, 2nd, 6th to 10th and 12th somites marked dorsally with crimson. Skin between the head and first somite black, but only visible when extended. The posterior edges of the somites with slight brown and white subdorsal streaks, most marked on the 1st, 2nd and 4th somites. Thoracic somites with backward-sloped, white lateral stripes, 6th to 10th somites with larger, forward-sloped, white lateral stripes. 4th somite with a small anterior and a large posterior white subdorsal dot, and three white spiracular dots, the posterior one largest. 5th to 10th somites each with a small anterior and posterior subdorsal white dot and three small spiracular white dots, 11th somite with the subdorsal dots but only the posterior spiracular one. Three subdorsal white streaks from the posterior half of the 11th somite backwards. Spiracles white, the rim brown. Venter green with a broad white double median stripe and a white lateral line. Legs pale green. Prolegs green, the first pair obsolete, with an external white stripe in continuation of the lateral white body stripes.

Pupa in a slight cocoon in a spun up leaf. Dull olive brown, the wing cases and intersegmental areas paler. Apex of abdomen longitudinally wrinkled. Cremaster a cluster of hooked spines attached to the silk of the cocoon.

Food-plant—*Rubus* sp.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 1-xi-45, spun 2-xi-45 and a male emerged 26-xi-45.

The imago agrees with the figure shewn in *Seitz Palaearctic Noctuidae,* iii, pl. 67, fig. c, but there is no reference in the text to this figure and I am unable to find any mention of the species in any of my books.

GEOMETRIDAE :

Ascotis (*Boarmia*) *selenaria* Hbn.

Head buff, minutely speckled with darker. Body olive buff, speckled with black. 2nd and 3rd somites each with a transverse series of six small black points. 4th somite with four black points on the dorsum, the anterior pair larger and closer together, and three on the lateral area. 5th somite with two large reddish tubercles anteriorly and two small black points posteriorly on the dorsum and three black points, of which the uppermost is largest, on the lateral area. 6th to 10th somites similar to the 4th. 11th somite slightly humped with an anterior series of four black points, the centre two largest, and a posterior pair of very small ones. 12th somite with a transverse series of four very small black points. 5th somite with a black mark before and behind the dorsal tubercles.

A few short bristly hairs. Venter buff with a double median blackish stripe and with transverse rows of very small black points. Legs pinkish. Prolegs buff.

Pupa subterranean. Dark chestnut brown, the wing cases tinged with olive, the head and thorax darker and with a dark dorsal line on the abdomen. 5th abdominal somite with a lateral, sunken, blackish streak anteriorly on the intersegmental area. Cremaster a stout spike ending in a double spine.

Food-plant—Apple.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 11-x-45, buried 19-x-45 and a female emerged 13-xi-45.

Abraxas sylvata Scop., *leopardina* Koll.

Hamps., *Fauna Brit. Ind.*, Moths, iii, 300. 1895.

Head yellow, the mouthparts black, and with a black spot above either end of the labrum, a large black spot either side of the vertex and another lateral spot. Body pale yellowish, the thoracic somites and somites 9 backwards slightly darker. 1st somite with a dorsal and subdorsal black spot anteriorly and a lateral and sublateral posteriorly. 2nd and 3rd somites with a dorsal, subdorsal, lateral and sublateral black spot. 4th to 8th somites each with a large black dorsal blotch, a transverse black bar posteriorly, a subdorsal, lateral and sublateral black spot, the subdorsal and lateral spots forming a quadrate blotch divided by a line of the ground colour. 9th somite similar but the spots smaller and the transverse bar divided in the middle. 10th somite with an anterior dorsal, subdorsal, lateral and sublateral spot, and a posterior spot between the dorsal and subdorsal, and the subdorsal and lateral. 11th somite with a dorsal, subdorsal, lateral and sublateral spot anteriorly and a dorsal bar and lateral spot posteriorly. Anal flap with the apex black. Venter whitish with a submedian and lateral series of quadrate black spots from the 4th to 8th somites. Legs black. Prolegs and anal claspers with a large external black spot. Cuticle very shiny and tough-looking.

Pupa subterranean. Very dark chestnut, the intersegmental areas paler. The head and antenna sheaths, and the divisions between the leg sheaths bright chestnut. Cuticle coarsely punctate but shiny. Cremaster a stout spine, the tip bifid.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 20-x-45, buried 22-x-45 and a female emerged 7-ii-46.

Hampson describes the larva as being 'bluish white; the dorsum yellowish, with a black line and series of black specks.'

PYRALIDAE:

Locastra cristalis Hamps.

Head black with a few colourless hairs. Body black, spotted with white as follows. 1st somite with an anterior transverse series of six and two sublaterally, one behind the other. 2nd somite with an anterior, median and posterior series of six each, another at the base of the leg, and a further series of smaller spots between the median and posterior series. 3rd somite similar. 4th and 5th somites with an anterior series of eight and a posterior of six, the lowest spot but one of the anterior series out of line with the others. 6th to 9th with an anterior and posterior series of eight spots, and a spot at the base of the proleg, the lowest spot but one of the anterior series out of line with the others. 10th and 11th somites similar, but the lowest spot but two out of line. 12th somite with two dorsal and four lateral spots. Clothed with sparse, single, colourless hairs. Lives gregariously in a common web.

Pupa in a cocoon of dark brown silk shaped rather like a butter bean, spun between leaves in captivity. Pale yellow brown, the intersegmental areas and a dorsal line on the abdomen darker. Spiracles blackish. Sutures between the leg sheaths, etc. dark brown. Rather stout, the end of the abdomen rounded.

Described from a full fed larva found at Tukdah (5,000 ft., Darjeeling District) 8-x-45, spun 19-x-45 and a female emerged 11-i-46.

CORRIGENDUM

On page 74 of volume xli (1939), for *Dasychira complicata* Wlk. read *Dasychira virescens* Moore.

(To be continued)

THE BIRDS OF THE SIMLA AND ADJACENT HILLS

BY

A. E. JONES, M.B.O.U. (deceased),

PART II

(With a plate)

(Continued from page 125 of this volume)

25. **Garrulax leucolophus leucolophus** Hardwicke. The White-crested Laughing-thrush.

SIZE: 12 inches.

FIELD CHARACTERS: Crest, throat and breast white; eye-stripe and ear-coverts black. Rest of plumage dark brown.

DISTRIBUTION: In the Simla area both banks of the Sutlej; below Naldera (rare); common just above Kalka from 2,500 feet to 3,500 feet (Koti). Outside our area, throughout the Himalayas to Central Burma where it meets the race *belangeri*.

GENERAL HABITS: Gregarious at all seasons; a flock usually consists of six to ten birds. Feeds for the most part on the ground turning over the dead leaves in its search for food and periodically indulging in its outbursts of cheerful laughing calls. Bamboo and cactus clad hillsides are its favourite haunts in these Hills.

NIDIFICATION: Takes place, according to Stuart Baker, from the end of March to the beginning of August. The nest is generally placed at a moderate height from the ground but sometimes as high as 20 feet, it is a roughly made shallow cup of grass, leaves and tendrils lined with rather coarse roots and grass bents. Eggs number from three to five and are glossy white without markings.

26. **Garrulax albogularis whistleri** Stuart Baker. The White-throated Laughing-thrush.

SIZE: 12 inches.

FIELD CHARACTERS: Upper plumage olive brown, throat and breast pure white; under parts rufous; tail white-tipped.

DISTRIBUTION: From the Murree Hills to Garhwal and Kumaon at elevations from 1,500 feet (winter) to 8,000 feet (summer). Further east it is replaced by the typical form.

GENERAL HABITS: Gregarious even in the breeding season flocks of from six to a dozen keep together. In the winter I have seen a flock of thirty or more. As a rule it is not a very noisy bird but when its displeasure is aroused it gives vent to the most extraordinary series of discordant screams and hisses. its haunts are the deep mixed forests of deodar and oak (*Q. dilatata*) and it feeds a good deal on the ground turning over the dead leaves in its search for insects.

NIDIFICATION: The breeding season commences in mid-April and continues till June, May being the month when most nests will be found. The nests are built of coarse grass and roots being lined with fine roots and rhizomorphs it is placed at medium heights from the ground, 8 feet to 20 feet, and is placed in a variety of situations, i.e. at the top of a sapling oak, in a briar or near the extremity of a horizontal branch. The eggs usually number three and are of a wonderful deep turquoise, unspotted, with a high gloss.

27. **Ianthocincla rufogularis occidentalis** Hartert. The Rufous-chinned Laughing-thrush.

SIZE: 10 inches.

FIELD CHARACTERS: Crown black; upper plumage olive brown, each feather tipped black; tail olive brown broadly tipped rufous; chin rufous; throat white; under parts pale ashy; under tail-coverts chestnut.

DISTRIBUTION: The *Fauna of British India*—Birds (2nd edition), Vol. 1, gives this from Kashmir to Kumaon but I can find no record of it west of the Simla Hills. After several years residence in these hills I found it first at Ganna-ki-Hatti beyond Jutogh and again about Koti on the Kalka-Simla motor-road. Both localities are between 3,000 feet and 4,000 feet.

GENERAL HABITS: As if it were conscious of its handsome appearance it is an arrant skulker, taking good care to keep close to good cover. Pairs and family parties seem to be the rule. Its food consists of insects and berries. The flight is feeble.

NIDIFICATION: The *F.B.I.* (Birds), 2nd edition, is definitely wrong in ascribing this species as breeding at elevations between 6,000 feet and 8,000 feet. Even in the breeding season I have never encountered it above 4,000 feet and doubt if it is ever found much above this height. Stuart Baker tells us in the *F.B.I.*, 2nd edition, that the nest is constructed from fine twigs and tendrils and lined with fine roots. The eggs are pure white and the usual clutch is of three.

28. **Trochalopteron erythrocephalum erythrocephalum** Vigors. The Red-headed Laughing-thrush.

SIZE: 11 inches.

FIELD CHARACTERS: Top of head chestnut; upper plumage olive brown, the edges of the tail feathers orange yellow; wings with a bright rusty bar with a patch of bright russet; lower plumage ashy tinged olive.

DISTRIBUTION: From Chamba in the west to Nepal. From Sikkim to Assam we have another race, *nigrimentum*. During the breeding season it is found between 7,000 feet to 8,500 feet. In the cold weather it descends to 3,000 feet in the Simla district.

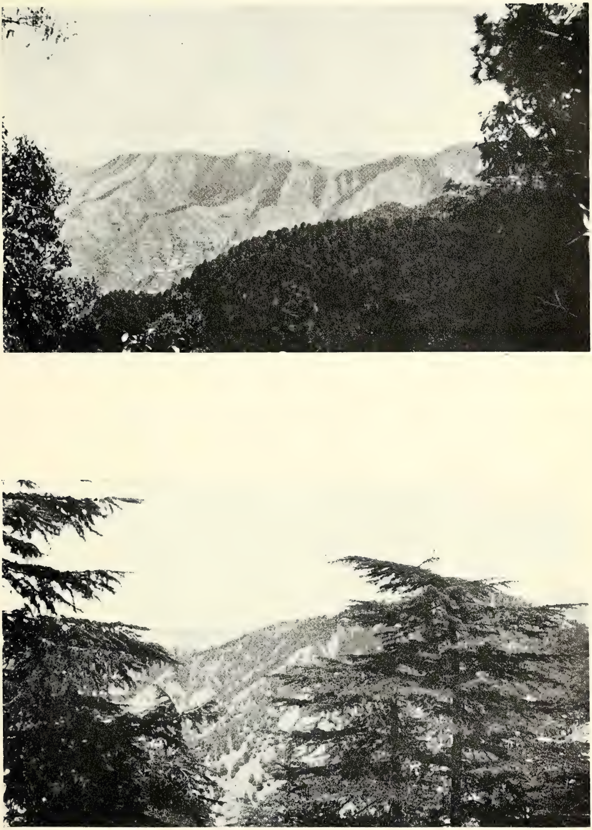
GENERAL HABITS: Frequents fairly dense undergrowth. During the nuptial season found in pairs but during the cold weather they form into small flocks. It has some very pleasant call-notes. When suspicious of danger a deep churring note is uttered. Shy and easily overlooked.

NIDIFICATION: Takes place from the end of May to August. Probably double-brooded. The nest is usually placed within two feet of the ground in a bush but rarely up to six feet; it is a substantial structure made of broad grass bents, fern leaves and lichens and lined with fine roots. The eggs number three or two. They are a beautiful turquoise blue sparsely marked with liver coloured spots, mostly at the broader end. In shape they are long ovals.

29. **Trochalopteron variegatum variegatum** Vigors. The Eastern Variegated Laughing-thrush.

SIZE: 11 inches.

FIELD CHARACTERS: The variegated wing (golden yellow or red, black, white and pale grey); conspicuous pale tips to the tail feathers which are golden



Photos by *A. E. Jones*

Views of the terrain, Simla hills

yellow on the outer webs; and olive brown upper plumage are diagnostic. Chin and throat black. From Chamba and Kangra westwards to Chitral and the Samana Range the race *simile* occurs. It differs from the Eastern form in having french grey replacing the golden and red of the wing and tail of *variegatum.*

Distribution : The Eastern form occurs from Kangra to Nepal. Western form from the Samana Range and Chitral to Kangra. Summer range 6,000 feet to 11,000 feet (Whistler). In winter usually below 6,000 feet down to 3,500 feet.

General Habits : A forest bird not nearly so shy as the Red-headed Laughing-thrush. Sociable for the major portion of the year, but pairs are the rule from May to August. Flocks up to 20 or more are not uncommon. It is a noisy bird but it lacks any pretence of being musical, though some of its notes are quite pleasant. Feeds on insects and wild fruit and berries and will often ascend some height from the ground in search of food.

Nidification : Period end of May to August. The nest is as a rule placed higher from the ground than the last species, i.e. 3 or 4 feet to 12 feet or more. It is a smaller structure than that of Red-headed species composed mainly of dry bents and lined with fine roots and rhizomorphs. The usual clutch is three, but sometimes they may number two and, very rarely, four; the colour of the eggs is pale blue with a tinge of green, blotched with liver brown more or less evenly distributed over the surface; the shape of the egg is a regular oval.

30. **Trochalopteron lineatum** Vigors. The Streaked Laughing-thrush.

Size : 8 inches.

Field Characters : General colour russet brown brighter on the ear-coverts, wings and tail; the latter being broadly tipped with palest grey.

Distribution : Extends from Ziarat, Baluchistan to Chitral, Gilgit, throughout the length of the Himalayas to Bhutan. With such a wide distribution it has developed several races. The race occurring in the Simla Hills is *T. l. grisescentior* Hartert.

General Habits : Not one of the gregarious Laughing-thrushes. Almost invariably seen in pairs hopping about on the ground. Occupies a zone between 4,000 feet and 10,000 feet. Very common in the Simla district where it may frequently be seen in our gardens and the less used thoroughfares of the town. It is by no means shy and enters verandahs to search the flower-pots for insects and sometimes takes the fibre of coconut matting for nesting material. The usual food is insects and berries and it is not averse to bread crumbs.

Nidification : The breeding season extends from March to September. Three broods are normally reared. A pair I had under close observation, when their first effort (when there was one egg in the nest) was destroyed by hail, built the new nest in a honeysuckle climbing up the verandah and 8 feet from the ground; this was in April and the young were safely reared. The next nest was in a ringall bamboo 3 feet from the ground. This was in June and the young were again successfully reared. The third effort was in August when I saw them building in a hibiscus 3 feet from the ground. Eggs usually number three but rarely four may be laid; the colour is turquoise blue, unmarked. Rarely a nest is placed on the ground under a tuft of grass or an overhanging fern. The Pied Crested Cuckoo (*C. jacobinus*) frequently victimises this species and Whistler also cites the Indian Cuckoo (*C. micropterus*) as foisting its eggs on it. The nest is made of dry grass and dead leaves, lined with fine grass stems and fine roots.

31. **Grammatoptila striata striata** Vigors. The Striated Laughing-thrush.

Size : 12 inches.

Field Characters : A large umber brown bird with each feather with a white shaft stripe. Full tufted jay-like crest; hoary outer webs to the first few primaries and fine white tips on the outer tail feathers. Iris red brown.

Distribution : From Kulu (and probably Kangra) to Bhutan. In the winter it is found as low as 1,500 feet (Ranibagh, Kumaon); in summer its habitat is mostly between 6,500 feet to 9,000 feet.

General Habits : During the breeding season this bird is seen in pairs, but in the cold weather small parties of three to five birds may be encountered. It is more arboreal than most of the Laughing-thrushes and is very shy and not loath to take an extended down-hill flight through the forest. It haunts the better wooded steep nullahs. Its presence is usually proclaimed by its loud cackling notes. Insects and berries form the major portion of its diet. It is local in its choice of habitat.

Nidification : The breeding season is in May and June. The nest is a broad shallow cup made of coarse grass mixed with small twigs and dead leaves, lined with fine roots. It is placed from 6 feet to 12 feet from the ground in a sapling, or in a wild rose climbing up through other trees. The only two nests found by me near Mahasu each contained two eggs slightly incubated; pale unmarked blue in colour and long ovals in shape.

32. **Turdoides somervillei sindianus ≷ terricolor.** The Jungle Babbler.

Size : 10 inches.

Field Characters : General colour dry earth brown, somewhat paler on underparts. Tail slightly darker tinged rufous. Iris pale cream, almost white.

Distribution : The whole of India from Cape Comorin in the south to the lower slopes of the Himalayas up to 5,000 feet. On the west it is found on the Salt Range and Kohat down to Sind. It has been divided into five races. Specimens from Ambala district are intermediate as above.

General Habits : One of the commonest Indian birds. Known to most by the name of 'Seven Sisters' and nearly always the flock consists of this number. It is a tame and noisy bird, mostly seen foraging among dead leaves on the ground. The flight is feeble, alternating flapping and gliding, and carries it from cover to cover.

Nidification : The breeding season in Northern India is from March to September. The nest is made of grass bents compactly interwoven but not uncommonly with loose straggling ends; it is lined with fine roots. The height from the ground varies from 3 feet to 15 feet rarely higher. Eggs number either 3 or 4; in colour deep blue with a high gloss. Often victimised by the Pied Crested Cuckoo (*C. jacobinus*) and the Common Hawk Cuckoo (*H. varius*) whose eggs closely resemble those of the foster parent.

33. **Argya caudata caudata** (Dumont). The Common Babbler.

Length : 9 inches.

Field Characters : 'Whole upper plumage pale fulvous brown, each feather streaked with dark brown; tail long, graduated, cross-rayed and the shafts very dark; chin and throat fulvous white; lower plumage pale fulvous, albescent on the abdomen and the sides of the breast faintly striated. Iris yellow brown.' (Whistler).

Distribution : In the Simla Hills it ascends to 5,000 feet, in the Ashni Valley, Keonthal State, where P. H. Jones took a nest with four eggs. 'It extends from Baluchistan, along the lower slopes of the Himalayas to Western Bengal and south to the Palni Hills and Rameswaram Island.' (Whistler).

General Habits : Always seen in parties of 6 to 20 birds, it is even more sociable than the Jungle Babbler and is abundant in scrub-covered arid country, not entering the forest. Feeds almost entirely on the ground. Insects and seeds form their chief diet. Loath to take to the wing. Flight feeble and direct with the long tail outspread.

Nidification : Nests may be found in almost every month of the year in the Plains but most will be found from March till September. The nest is a smaller edition of the Jungle Babbler's; the eggs are usually 3 to 4 in number, in colour much the same as the latter's but slightly smaller in size. The nest is usually placed from 3 to 4 feet from the ground.

34. **Pomatorhinus schisticeps pinwilli** Hodgson[1]. The Slaty-headed Scimitar Babbler.

Length : 10 inches.

Field Characters : Crown of head dark slate; conspicuous white supercilium; black ear-coverts; upper plumage olive brown; chin, throat and breast white; flanks and abdomen chestnut.

Distribution : In the Simla Hills mostly found between 3,000 feet and 4,000 feet. Local and resident. Stuart Baker gives for our race (*pinwilli*) 'N.W. Himalayas to Garhwal'. Whistler found it 'somewhat scarce' in the Kangra district.

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[1] Perhaps more correctly *pinwilli* ≷ *schisticeps* (W 6 ♂♂ 94-99, 1 ♀ 95 mm.) —S.A.

General Habits : After the breeding season bands together in small flocks which keep to the undergrowth and feed for the most part on the ground where they turn over the dead leaves in their search for insects; berries also enter their menu. They have some hooting and bubbling notes, specially when suspicious of danger.

Nidification : The domed nest is usually placed on a sloping bank among the herbage. It is made of grass bents, dead leaves and tendrils, lined with fine roots. The eggs are pure white and number 3 or 4. The breeding season extends from March to June.

35. **Pomatohinus erythrogenys erythrogenys** Vigors. The Rusty-cheeked Scimitar Babbler.

Length : 11 inches.

Field Characters : Upper parts olive brown; under parts white; forehead, sides of head and neck and flanks chestnut. Long, curved bill and white iris.

Distribution : In our area it is found from 2,500 feet to 6,500 feet, exceptionally somewhat higher. Outside our boundaries Stuart Baker gives 'N.W. Himalayas'. Whistler says it is common about Dharmsala; west of this I can find no record.

General Habits : Nearly always seen in pairs haunting the sides of scrub-covered nullahs, the fringes of forest and bush-clad grassy hillsides. Eschews heavy forest. Has a far reaching call-note consisting of three notes, the first two uttered by the male immediately followed by the third so that it sounds as if the three notes were the effort of one bird. The food consists of insects, seeds and berries.

Nidification : Takes place from mid-March to June. The nest and eggs, situation, etc. do not differ from those of the foregoing species. The eggs usually number two or three and are slightly larger than *P. schisticeps*.

36. **Chrysomma sinensis sinensis** (Gmelin). The Yellowed-eyed Babbler.

Length : 7 inches.

Field Characters : Upper parts russet brown; broad white supercilium; lower parts white; long graduated tail. Iris yellow; eyelids orange.

Distribution : About Simla it occurs up to 3,500 feet. Otherwise practically the whole of India being represented by races on its western and eastern boundaries.

General Habits : As a rule found in small parties after the breeding season which work through the lighter vegetation, i.e. bush-clad grassy hillsides, hedges and secondary growth. Has a pleasant chattering call-note. A very attractive bird when not alarmed, otherwise dives into cover until its suspicions are allayed. Its strong legs enable it to climb any tall grass or reed which are much affected.

Nidification : From June to September. The nest is placed in a variety of situations from 1 foot to 6 feet from the ground; it is a very characteristic structure, neat and compact composed of dry grass stems and blades copiously covered on the outside with spiders' web, almost indestructible and often found after the breeding season when the herbage has died down. The usual clutch consists of 4 or 5 eggs which partake of two very distinct types, both have the ground colour very pale pink, one type is profusely and finely freckled all over the surface with deep brick red; the other is sparingly and boldly blotched with sienna brown with a few underlying markings of pale inky-purple.

37. **Pellorneum ruficeps jonesi** Stuart Baker. The Spotted Babbler.

Length : 6 inches.

Field Characters : Upper parts olive brown; under parts pale cream conspicuously spotted with black on the breast and flanks; head and nape dull rufous.

Distribution : In the Simla area found from 2,500 feet to 4,000 feet. Elsewhere from the Kangra district along the lower Himalayas to Assam and Burma down the hilly tracts of India to Travancore. Divided into several races.

General Habits : A very retiring quiet bird easily overlooked. Met with in pairs or small scattered parties turning over the dead leaves on the ground in low scrub jungle and bamboos. Has a very clear call-note *wheat-ear* the last syllable rather prolonged.

Nidification : Commences in March and continues throughout the rainy season. The nest is placed on the ground, composed mostly of dead leaves and is a domed structure. Eggs number from 2 to 4, they are white tinged with pale green or cream blotched and speckled with red brown and inky purple.

38. **Stachyridopsis pyrrhops** Blyth. The Red-billed Babbler.

LENGTH: 4½ inches.

FIELD CHARACTERS: A small olive brown bird with dull russet head; black lores, eyestripe and chin; under parts fulvous; flanks olivaceous.

DISTRIBUTION: From Murree to Nepal. Common in the Simla Hills from 2,500 feet up to 6,500 feet, occasionally slightly higher.

GENERAL HABITS: Resident. During the cold weather associates in small parties which feed mostly on the ground turning over the fallen leaves in their search for insects; rarely may ascend a tree as high as 12 feet. Not infrequently the flocks are joined by other insectivorous birds. Keeps to the lighter scrub and hedgerows, a favourite resort being a small nullah near a tiny stream.

NIDIFICATION: The birds separate off into pairs in March and nests may be found from April to July. The situation for the nest is low down in scrub though I once found one five feet from the ground in a holly tree, it is a domed structure and the materials used are mostly dead leaves loosely put together and difficult to remove from its site without it falling to pieces; lined fibres and pine needles. The eggs generally number 3 or 4; they are white sparsely marked with pale red blotches.

39. **Fulvetta vinipecta kangrae** Ticehurst. The Kangra Fulvetta.

LENGTH: 5 inches.

FIELD CHARACTERS: A small brown bird with a longish tail and a broad white supercilium; head, ear-coverts and nape reddish brown; chin, throat and breast white gradually shading into dark fulvous on the abdomen and under tail coverts.

DISTRIBUTION: Kangra to Assam; divided into 3 or 4 races. In our area a bird of high elevation. Only two records, both at Narkanda 9,000 feet September 1918 and December 1926. On both occasions the birds were in a small party of 6 to 8 and in precisely the same patch of bushes near the gate of the Government Dak Bungalow. Whistler found it near Palampur in the Kangra Valley as low as 5,000 feet.

GENERAL HABITS: Except for its colour this species is very reminiscent of the Yellow-eyed Babbler. They work through the bushes in their search for food and are not shy.

NIDIFICATION: Many years ago A. O. Hume had eggs sent to him from Narkanda. Stuart Baker gives May and June as the breeding season. The nest is a deep cup composed of grass and moss placed low down in a bush. The eggs number 2 or 3 and are of a blue grey colour, marked at the larger end with sepia, dark brown and a few underlying blotches of a pale neutral tint.

40. **Leioptila capistrata pallida** (Hartert). The Black-headed Sibia.

LENGTH: 9 inches.

FIELD CHARACTERS: Head, ear-coverts and cheeks black; full crest which it raises and flattens. Back ashy grey; underparts bright salmon rufous; long graduated tail; tail broadly edged with blue grey.

DISTRIBUTION: Hazara to Kumaon. Specimens obtained by me below Naini Tal differ in no way from our Simla birds (*pallida*).

GENERAL HABITS: Resident with considerable altitudinal movement. In the cold weather it may be seen as low as 1,000 feet (Kathgodam, Kumaon); in summer its haunts are mostly between 6,000 feet and 9,000 feet. Small parties are the rule during the winter when they are often seen feeding from the flowers of the Silk Cotton Tree (*B. malabaricum*). Its diet includes insects and berries. Has a beautiful ringing note *titeree-ree-ree-ree*. Arboreal; shows a decided preference for mixed evergreen forest.

NIDIFICATION: Most nests will be found in June, July and August but I have seen them carrying moss in April. The nest is placed, often near the extremity of a branch, from 10 feet to 30 feet or more from the ground. It is a deep cup composed mostly of green moss on the exterior and neatly lined with pine needles. The eggs number 2 or 3, one type has the ground colour pale bluish green, the other is white and both are blotched with dark red brown.

41. **Siva strigula simlaensis** Meinertzhagen. The Stripe-throated Siva.

LENGTH: 6½ inches.

FIELD CHARACTERS: Forehead, crown and nape bright orange brown; throat pale yellow barred with black; tail with broad orange or flame-coloured tips.

DISTRIBUTION : From Kangra to Assam.

GENERAL HABITS : Arboreal. A bird of the higher elevations, in summer up to 10,500 feet. In winter it is sociable and will be seen in flocks of 6 to as many as 20. A very active bird which never seems to pause for half a minute in its tireless search for food which consists of small berries and insects. Note, a piping *peep-peep-peep*. No attempt at a song. In winter descends to 5,000 feet.

NIDIFICATION : Takes place in June as far as is known. B. B. Osmaston found a nest in Garhwal, (*J.B.N.H.S.*, Vol. XXV, No. 3, p. 494). I found a nest near the top of Kufri hill at an elevation of 8,600 feet, it was situated 4½ feet from the ground placed in a small Sallow (*Salix*) sapling. The exterior was made of dry grass and moss lined with hair. Eggs, incubated 3 or 4 days, blue green with black spots mostly at the large end, small replicas of the British Song Thrush's. Date 30-6-1918.

42. **Ixulus flavicollis albicollis** Ticehurst. The Yellow-naped Ixulus.

LENGTH : 5½ inches.

FIELD CHARACTERS : Upper plumage olive brown, the shafts of the feathers pale; full tufted crest chocolate; broad pale cream collar; black moustachial streak; underparts pale fulvous.

DISTRIBUTION : Kangra to Bhutan.

GENERAL HABITS : Arboreal. Its habitat in the Simla Hills is mainly in the oak forests. There is some seasonal movement; in summer it is definitely scarce between 6,000 feet to 8,000 feet in the more remote nullahs. In winter, though still not common, it is more frequently to be seen as it moves closer into the outskirts of Simla. Its presence is usually proclaimed by its metallic call-note *tse-kling*. Pairs are the general rule, but on one occasion a flock of 8 was seen feeding on the berries of the Bedstraw (*Galium rotundifloium*).

NIDIFICATION : The breeding season is said to be May and June. The nest is made mostly of moss lined with roots and is placed amongst the moss growing on the branches of trees at no great height from the ground; in shape it is domed or cup-shaped. Eggs number 3 or 4 and are white with blotches and spots of dark red-brown with underlying markings of inky purple.

43. **Leiothrix lutea calipyga** (Hodgson). The Red-billed Liothrix.

LENGTH : 6 inches.

FIELD CHARACTERS : Upper plumage olive green; primaries edged with yellow and crimson; chin and throat yellow, shading to orange on the throat; abdomen yellow; very narrow white edges to the tail.

DISTRIBUTION : Kangra to Assam including the Khasi Hills. Locally common at 3,000 feet at Koti on the Kalka-Simla motor-road and rare in summer up to 6,000 feet (Kasauli).

GENERAL HABITS : Gregarious in the winter when it may be seen hopping about on the ground and turning over the dead leaves. Tame and fearless; prefers to hop across the road rather than fly. The flocks break up into pairs in April.

NIDIFICATION : Takes place from June to August. The nest is a shallow cup slung in a creeper or bush 2 or 3 feet from the ground, and is composed of fine bents and a dead leaf or two, lined with fine roots and hair. The clutch usually numbers 3 but sometimes only 2 incubated eggs are found. In colour they are pale sea green blotched, mostly at the large end, with dark liver and red brown.

44. **Pteruthius erythropterus** (Vigors). The Red-winged Shrike-babbler.

LENGTH : 7 inches.

FIELD CHARACTERS : Male, head from forehead to nape black; a broad white supercilium; ear-coverts black; upper plumage blue-grey; visible portions of primaries black conspicuously tipped white; inner secondaries bright chestnut; under parts white. Female, head ashy olive; upper plumage olive grey; supercilium indistinct.

DISTRIBUTION : From the Hazara country to Manipur.

GENERAL HABITS : Arboreal. Confined chiefly to the broad-leaved forests. In the summer observed in pairs only; in winter the birds form into small parties of 6 to 10. Not uncommon on the outskirts of Simla. It keeps for the most part to the higher canopy. Its food consists of insects. In summer found mostly between 6,000 feet and 8,500 feet; in winter down to 3,500 feet.

Nidification : The breeding season is from April to June and this species is probably double brooded. Col. R. H. Rattray who took a nest near Murree says it is one of the most difficult nests to take owing to its being built towards the extremity of a branch high up in the tree; I quite agree with him. The nest is built of fibres, moss and lichen plastered lavishly with spiders' web where it is attached to the supporting branches; the lining is of fine roots. The means of suspension is reminiscent of that of the Golden Oriole. The eggs number 2 to 4; in colour they are white tinged with pink and profusely marked with fine blotches of deep claret, altogether like some eggs of the White-cheeked Bulbul, but broader ovals than those of the latter bird.

45. **Pteruthius xanthochloris occidentalis** Harington. The Simla Green Shrike-babbler.

Length : 5 inches.

Field Characters : Sexes alike, female slightly duller than the male which on the upper side is a dull olive green with a wash of grey on the head; closed wing green, primary coverts black; undersides, throat and breast pale ashy; abdomen buff. A dull bird with no striking feature to fix on. Arboreal.

Distribution : From Kangra Valley to the hills north of the Brahmaputra. From 4,000 feet to 9,000 feet.

Nidification : B. B. Osmaston first found the nest in Garhwal. Several nests found by me in the Simla Hills. These were placed from a foot from the ground to 6 feet. They were suspended at the bifurcation of a small twig; deep, purse-shaped little structures, flimsy and fragile-looking made of fine fibres bound together with spiders' web with flakes of lichen plastered sparingly on the outside. The lining is of fine roots and rhizomorph. The eggs are cream coloured with blotches of red-brown mostly in a zone at the larger end; they number from 2 to 4. Nests taken in *Skimmia*, spruce and oak.

46. **Microscelis psaroides psaroides** (Vigors). The Himalayan Black Bulbul..

Length : 10 inches.

Field Characters : A dark grey bird with black crest. Bill, legs and feet coral red. Tail distinctly forked. Sexes alike.

Distribution : From the Hazara country (and probably further westward) to Bhutan. In the Simla Hills it is found from 8,000 feet, in summer, down to the foothills and plains (Ambala) in winter. Common. Another sub-species is found in the hills of Southern India.

General Habits : A bird of the deeper mixed forests. Its presence is usually proclaimed by its discordant notes. The flight is strong and direct. Big congregations occur in the cold season which may be seen alighting at the tops of the forest trees before flying off to its next objective. The food consists of berries and insects. It is also one of the commoner species which visit the flowers of the Silk Cotton Tree (*Bombax*).

Nidification : April to June is the extent of the breeding season. The nest is placed in a tree some little height from the ground; it is composed of dry grass, leaves and moss strengthened by cobweb, lined with pine needles and fine roots. It is generally well concealed. The eggs number 2 or 3 (I have known a singleton highly incubated); in colour they are pale pink profusely speckled with claret and inky purple.

47. **Molpastes cafer intermedius** (Blyth). The Red-vented Bulbul.

Length : 8 inches.

Field Characters : General colour earth brown, with a slightly crested black head; rump white; crimson under tail-coverts.

Distribution : Practically the whole of India, where it is split into several races. In the Simla Hills we have *M. c. intermedius* which occurs up to 5,000 feet and occasionally higher.[1]

General Habits : Resident. Common about cultivation and open bush-clad hillsides. Usually seen in pairs or small family parties. Berries form its principal diet but it frequently indulges in fly-catching and may often be seen visiting the flowers of the *Bombax* tree. Tame and confiding.

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[1] Specimens from Simla are certainly *intermedius* $\lessgtr$ *bengalensis*—S.A.

Nidification : Most nests will be found in May and June. These may be placed in a bush or sapling 1 or 2 feet from the ground to 10 feet or so up in a small tree. The materials used are dry grass and fibres with a few dead leaves and lined with fine roots and horse- or human-hair. 3 or 4 eggs form the usual clutch, but 5 are rarely found. In colour they are pale pink densely freckled with claret red and inky purple. Occasionally the markings partake of fairly large blotches tending to form a nimbus round the large end.

48. **Molpastes leucogenys leucogenys** (Gray). The White-cheeked Bulbul.

Length : 8 inches.

Field Characters : Conspicuous forward-curving dark brown crest; white ear coverts; chin and throat black; back olive brown, paler on abdomen; under tail coverts sulphur yellow.

Distribution : This is essentially a hill bird and occurs from Afghanistan to Assam at elevations from the foothills up to 8,000 feet or even more (Mathiana).

General Habits : A common resident with very little altitudinal movement. One of the most conspicuous birds of the Simla Hills. It is as a rule seen in pairs or small family parties. A bird of the bush-clad hillsides and cultivation, not infrequently seen on the ground. Its food consists mostly of fruit and insects and often may be seen indulging in fly-catching flights. The note is cheery and tinkling.

Nidification : The breeding season is from the end of March to July. Most nests are low down in a bush within easy reach of the ground; there is very little attempt at concealment. A favourite site is in the interior of a *Berberis* bush. The nest is built of yellow grass stems, the lining is of finer grasses and fibres of the same colour so that it is easily distinguished from that of the former species. Eggs number from 2 to 4 and are slightly smaller and narrower than those of the Red-vented Bulbul. In colour and character of markings they pass through the same variations.

(The *F.B.I.* (2nd edition) says the Red-whiskered Bulbul, *Otocompsa jocosa* (Linneaus) occurs from Simla eastwards but this is definitely wrong. It is doubtful if it extends as far west as Dehra Dun).

49. **Certhia himalayana himalayana** Vigors. The Himalayan Tree-creeper.

Length : 5½ inches.

Field Characters : The brown mottled upper side, white underparts, long slender curved bill and long tail should help to fix its identification.

Distribution : N.W. Himalayas to Kumaon. Also Baluchistan.

General Habits : This is a solitary bird whose whereabouts are usually betrayed by its squeaky call-note; it also has a pretty though short song which may be heard throughout the year. Its mode of feeding is a safe guide to its identity; this takes the form of starting near the base of a tree trunk working up to a good height and then flying off to another tree to repeat the process. Insects are its main diet. It is a common resident found principally between 5,000 feet and 10,000 feet. Often attaches itself to the mixed foraging parties of small insectivorous birds.

Nidification : Takes place from the end of March and throughout April. The nest is placed in a natural hole of a tree, a deserted woodpecker's hole, a crack in an old building and frequently between a tin name-plate and the bark of a tree. The height from the ground may be anything from one foot to 50 feet. The foundation of the nest proper is composed of a quantity of very fine twigs, on this the nest of fine dry grass, moss and sometimes a leaf or two and finally lined with fur and occasionally a few feathers. The clutch numbers from 4 to 6. The eggs are white densely or sparsely blotched with light red.

50. **Tichodroma muraria** (Linneaus). The Wall-creeper.

Length : 7 inches.

Field Characters : General colour, french-grey; wings crimson with white spots which are conspicuous in flight. A long slender black bill.

Distribution : Only visits us in the cold season, October to April. Found at all elevations and some distance out into the plains.

General Habits : Solitary. Its usual haunts are the steep cliffs and road cuttings and similar situations, i.e. masonry, both stone and brick, so long as there is the chance of finding food which consists of spiders and other insects. Even earthen cliffs are diligently searched for food.

NIDIFICATION : Is said to take place in May and June. The nest consists of moss and dry grass lined with wool and hair and is placed in a crevice of a precipice. The clutch consists of 4 to 6 eggs which are white sparsely spotted with red. The summer quarters are between 12,000 feet and 16,000 feet.

51. **Troglodytes t. neglectus** Brooks. The Kashmir Wren.

LENGTH : 3¾ inches.

FIELD CHARACTERS : A small dark brown bird, closely barred with black; undersides slightly paler. Short tail, which is usually carried above the level of the body.

DISTRIBUTION : Resident with some altitudinal movement with the seasons. It is found in the vicinity of Simla, about 5,600 feet to 7,500 feet from the end of October to the middle of March. Waite found it 'fairly common' at Chini and Nachar and saw young ones at the former place (9,265 feet) on June 3.

GENERAL HABITS : A bird of solitary habits, it mostly frequents the rocks and boulders of the lesser nullahs where it skulks about the herbage and mossy banks. Its presence is revealed by its sharp rattling note and if the observer stands still for a minute or so the little vocalist can generally be seen as it creeps mouse-like from cover to cover.

NIDIFICATION : Waite's is the only record I can find for our area. The *F.B.I.* (2nd edition) is silent as regards the breeding season. The nest, for the size of the bird, is a large globular structure composed of moss, grass and dead leaves and lined with feathers. The entrance is at the side. The situation is variable, from ground level to 30 feet above it. The eggs are white with pale rusty red specks and blotches; they number from 4 to 6.

52. **Pneopyga albiventris pallidior** Kinnear. The Scaly-breasted Wren.

LENGTH : 4 inches.

FIELD CHARACTERS : A curious tail-less little bird whose habits do not differ in any way from those of the previous species. Two forms are found in these hills, viz. one with the breast squamated with fulvous, the other with white. Both types are russet brown above.

DISTRIBUTION : In races from the Kangra Valley to Assam. It is a winter visitor to the Simla Hills between 6,000 feet and 8,500 feet and may be found from mid-October to the end of March.

GENERAL HABITS : Usually found singly, in winter. Any small nullah seems to suit its requirements as long as there are plenty of exposed rocks and stones for it to explore. It has a monosyllabic loud suction-like call-note.

NIDIFICATION : I have no information regarding the breeding of this wren in the Simla Hills. W. H. Matthews found it nesting in the Bhillung Valley, Tehri Garhwal; he found the nest on 6-6-1914 at an elevation of 10,500 feet. The nest was built almost entirely of moss, domed and with a side entrance, placed under a moss-clad rock. There were 3 fresh eggs in the nest, large for the size of the bird, pure white with a few reddish-brown specks.

53. **Tesia castaneocoronata** (Burton). The Chestnut-headed Wren.

LENGTH : 4 inches.

FIELD CHARACTERS : Forehead, crown and nape bright chestnut; upper plumage dark olive green; underparts bright yellow.

DISTRIBUTION : Sparsely distributed about the Simla Hills. Whistler found it not uncommon in Kulu in winter.

GENERAL HABITS : A winter visitor from the end of October till the end of March; once in May (3,500 feet). In these hills its usual habitat is in the dense evergreen scrub near a tiny hill stream, where it creeps about the herbage close to the ground, its yellow underparts being conspicuous. Like the other wrens, it is solitary during the winter months. Found from 6,000 feet down to 3,500 feet.

NIDIFICATION : Stuart Baker in the *F.B.I.* (2nd edition), tells us that the Chestnut-headed Wren breeds between 6,000 feet and 8,000 feet in June and July and that the nest is much like that of the last named species. It is placed either in a bush or a low branch of a tree and is lined with feathers. The eggs numbering 3 or 4 are much like those of the Scaly-bellied Wren but richer in colouring. He does not specify any locality where they were taken.

54. **Cinclus pallasii tenuirostris** Bonaparte. The Brown Dipper.

LENGTH : 8 inches.

FIELD CHARACTERS : A sombre brown bird with a short tail; rather reminiscent of a large wren.

DISTRIBUTION : Throughout the Himalayas. From the base of the hills to 7,000 feet. Has rarely been recorded as high as 12,000 feet.

GENERAL HABITS : Resident. A bird of the streams from which it obtains practically all its food which consists of aquatic insects and larvae. From shallow water it wades till out of its depth when it submerges, swims and even walks on the bed of the stream. The flight is direct and usually within a foot of the surface of the water. It has a full, rich though short song in the breeding season; the call-note is a shrill, harsh *dzit-dzit*.

NIDIFICATION : The breeding season is from the second half of December to mid-February. The nest is a massive globular structure made of green moss, lined with dry leaves, and has the entrance at the side. The situation is a cleft in the rocks from a foot to 4 feet above the surface of the water. Another situation is in a deep hole in the masonry of a bridge, in which case, as usual, it plasters the top of the cavity with moss. The clutch consists of 4 or 5 somewhat pyriform white eggs, the yolks of which show through the shell when fresh.

55. **Luscinia brunnea brunnea** (Hodgson). The Indian Blue Chat.

LENGTH : 5 inches.

FIELD CHARACTERS : Upper parts dull slaty blue; a conspicuous white supercilium; underparts from chin bright chestnut shading to white on the abdomen. Female, olive brown paler below.

DISTRIBUTION : Throughout the Himalayas from Kashmir to Bhutan. In the Simla Hills occupies a zone between 6,500 feet and 9,000 feet.

GENERAL HABITS : Summer visitor, arriving in May and leaving in September. Its presence is proclaimed by its loud trilling song uttered from the low brush wood clothing the low ravines, its favourite resort during the breeding season. Its song is again heard on its downward migration in September.

NIDIFICATION : This species breeds from the end of May to the beginning of July. The nest is placed on the ground among the luxurious herbage clothing the steep hillsides and is very carefully concealed. It is composed of moss and dry grass and lined with fur, hair and fine rhizomorphs. The clutch consists of 3 or 4 eggs of a Hedge-Sparrow blue, spotless and with a fine gloss.

56. **Hodgsonius phoenicuroides phoenicuroides** (Gray). Hodgson's Shortwing.

LENGTH : 7½ inches.

FIELD CHARACTERS : Above, dark slaty blue, chin, throat and breast the same; abdomen white; base of outer tail feathers chestnut. Female olive brown with base of tail feathers as in the male.

DISTRIBUTION : Its summer haunts are from 9,000 feet to 10,500 feet, i.e. Narkanda and Baghi and doubtless beyond. Otherwise, outside our limits, from Kashmir to Yunnan.

GENERAL HABITS : The status of this bird is somewhat obscure. It probably undergoes a certain amount of vertical movement with the seasons. Its habitat during the breeding season is the under-scrub in and on the edge of forest. In habits it is very retiring unless the vicinity of its nest is invaded. The alarm note is similar to that of the Bluethroat.

NIDIFICATION : The breeding season is during June and July. The nest is placed on or near the ground and is cup-shaped, composed of grass and dead leaves and lined with fur and fine grass. The eggs usually number 3, and are a deep blue-green with a fine gloss.

57. **Saxicola caprata bicolor** Sykes. The Pied Stone-Chat.

LENGTH : 5½ inches.

FIELD CHARACTERS : The male is almost completely black with a conspicuous shoulder patch of white. The under tail coverts and abdomen are also white. The female is dark brown with rusty upper tail coverts.

DISTRIBUTION : A common summer visitor from the foothills up to 6,000 feet. Arrives at the end of March and departs in August.

GENERAL HABITS : Wherever it is found it cannot easily be overlooked owing to its habit of perching on either the crown of a bush, a telegraph wire or a commanding rock from which the male pours out his pleasant little song. Bush-clad grassy hillsides and the neighbourhood of cultivation are its favourite haunts.

NIDIFICATION : This bird begins nesting operations in April but most nests will be found in May and June. The nest is placed on the ground and is always well concealed either under a rock or herbage. It is a shallow cup of grass-bents lined with hair. The clutch usually consists of 4 or 5 eggs. The ground colour is palest blue marked mostly at the broad end with deep red brown blotches and freckles. Quite a lot of the nests are cuckolded by the European Cuckoo (*Cuculus canorus*).

58. **Saxicola torquata indica** (Blyth). The Indian Stone-Chat.

LENGTH : 5½ inches.

FIELD CHARACTERS : In summer plumage the head, ear-coverts and throat are black as are also the back, tail and most of the wing; there is a conspicuous patch of white on the shoulder which is also the colour of the rump and upper tail-coverts; the lower plumage is white except for the bright orange-rufous breast. In winter plumage all the black feathers are broadly fringed with fulvous which greatly alters the general appearance of the bird. The female is rufous brown above, paler below.

DISTRIBUTION : In summer found mostly between 5,500 feet to 8,000 feet throughout the Himalayas. In winter descends to the plains.

GENERAL HABITS : A bird of the open bush-studded grassy hillsides and cultivated terraced fields. Often utters its song on the wing and indulges in the 'windmill' love flight. It may often be seen launching itself into the air after winged insects but the normal mode of securing its prey is to pounce on it from an elevated perch. Besides its own song and call-notes it will also mimic other birds' notes.

NIDIFICATION : Differs in no way from that of the Pied Stone-Chat. The markings on the eggs are as a rule paler. Like that species the European Cuckoo frequently foists its egg on the Indian Stone-Chat.

It may be added here that the Turkestan race *S. torquata przewalskii* is not uncommon at the lower elevations, 1,500 feet to 2,500 feet, from November to March.

59. **Rhodophila ferrea ferrea** (Gray). The Dark Grey Bush-Chat.

LENGTH : 6 inches.

FIELD CHARACTERS : The male in summer plumage is from bill to tail almost pure black; edges of tail white; a broad white eye-stripe; ear-coverts black; underparts from chin to under-tail coverts white, tinged with isabelline on the breast; a white bar on the shoulder. The female is russet brown above; paler below with rufous tail.

DISTRIBUTION : During summer occupies a zone between 5,000 feet to 10,000 feet. In winter from 4,000 feet down to the foothills and often well out into the plains.

GENERAL HABITS : Summer visitor, returning to its breeding haunts early in March, leaving in October; the males arrive a week or ten days before the females. Its favourite haunts about Simla are the bush-clad glades contiguous with forest, such places being afforded by our gardens. It is one of our commonest summer visitors and the male makes considerable use of telegraph wires whenever these happen to be near its chosen haunts. It is by far the most accomplished mimic we have, imitating perfectly most of the small birds in its vicinity, its own song being a simple little trill while the alarm note is *geeze.* It frequently indulges in fly-catching.

NIDIFICATION : The breeding season is from early April to July, 2 broods being reared sometimes, it is said, in the same nest. This is always placed on the ground on a sloping bank and is well concealed by grass or herbage. The female alone incubates and is very wary when approaching the nest. This is a more substantial structure than that of the Stone-Chat but otherwise similar. The eggs numbering 4 or 5, are slightly larger and deeper in ground colour though the markings are paler and tend to form a zone at the large end.

60. **Œnanthe pleschanka pleschanka** (Lepschin). The Upland Wheatear.

LENGTH : 6½ inches.

FIELD CHARACTERS : Above black (summer) with a pale cream or white forehead and supercilium; throat and upper breast black; tail black with broad white bases; below from breast pure white.

DISTRIBUTION : In our area Waite found it not uncommon on the bare hillsides about Kanam and Poo.

GENERAL HABITS : A bird of the more barren wastes.

NIDIFICATION : Breeds in Ladakh where Whistler and Osmaston took the nest. No doubt the birds Waite saw were on their breeding ground.

The *F.B.I.* (2nd edition) has applied the trivial name 'Pied Chat' to two birds of this genus, i.e. *Œ. picata* and this species, so I have differentiated the present bird by the above name.

61. **Œnanthe xanthoprymna chrysopygia** (De Filippi). The Red-tailed Wheatear.

LENGTH : 6½ inches.

FIELD CHARACTERS : Forehead to back and scapulars pale fawn, brighter rufous fawn or chestnut on the rump; tail bright chestnut with the two middle feathers black the remaining feathers with a broad terminal band of the same colour; lower parts isabelline tinged pink. It is the only chat (or wheatear) with red bases to the tail feathers.

DISTRIBUTION : In our area an accidental passage migrant. I obtained a specimen at Sairee (5,000 feet) on 29-9-1912, which Dodsworth recorded in the *Journal*, Vol. XXII, No. 1, p. 196. Hingston obtained it at 4,500 feet at Dharmsala, and Whistler saw one at Ranital 1,800 feet (in the same district) 25-9-1921.

GENERAL HABITS : A winter visitor to the N.W. of India as far south as Rajputana, Cutch and Sind. A bird of the arid, bush-clad (*Capparis*) wilderness.

NIDIFICATION : Breeds in Persia from 6,000 feet upwards as recorded by A. J. Currie in the *F.B.I.*, Vol. ii, p. 54. The clutch consists of five pale sea-green or bluish-white eggs, either spotless or with a few faint brown specks about the larged end.

62. **Cercomela fusca** (Blyth). The Brown Rock-Chat.

LENGTH : 6½ inches.

FIELD CHARACTERS : A plain brown robin-like bird. The tail and wings are darker than the remaining plumage; below from chin to abdomen paler. Sexes alike.

DISTRIBUTION : A few pairs at Kalka, otherwise not observed in our area.

GENERAL HABITS : A tame fearless bird, frequenting both human habitations and rocky gorges. Has a characteristic habit of slowly raising its tail above the level of its back. It has a very sweet, though short song in the breeding season.

NIDIFICATION : The breeding season is from March to August. The nest is placed on a ledge of a ravine, or window-sill; it is composed of grass-bents and lined with scraps of rope, raffia, hair and wool and is often surrounded by a rampart of small pebbles, ***kankar*** and lumps of earth. The usual clutch is 3 or 4 but 5 may rarely be found. The colour is a beautiful blue generally sparsely marked at the large end with a few rusty blotches and specks.

63. **Enicurus maculatus maculatus** Vigors. The Western Spotted Forktail.

LENGTH : 11 inches.

FIELD CHARACTERS : A black and white wagtail-like bird with a long forked tail. Forehead, crown, rump, breast and underparts white; remaining plumage black with white spots on the back and a broad white bar on the wings; tail black with broad white tips. Sexes alike.

DISTRIBUTION : From 3,000 feet to 8,000 feet. Said to ascend considerably higher in some localities.

GENERAL HABITS : A bird of the quieter wooded mountain streams where it wades in the shallows and runs about sedately over the stones and boulders in its search for aquatic insects, all the while slowly swaying the tail. The usual call-note is a loud *tseer* exactly like the Whistling Thrush which frequents similar localities.

NIDIFICATION : Eggs may be found from mid-April to the end of June or beginning of July. The nests are always placed in close proximity to a stream.

The situation is generally on a ledge of a moss-grown rock overhung and sheltered from the elements. The nest is a deep cup of fresh green moss lined with skeleton leaves. The clutch consists of three eggs which are very pale green or pale cream, marked with reddish-brown blotches and spots. This bird is a favourite fosterer of the European Cuckoo.

64. **Microcichla scouleri scouleri** (Vigors). The Little Forktail.

LENGTH : 5 inches.

FIELD CHARACTERS : A small stub-tailed replica of the foregoing species; tail measures usually less than 2 inches. Sexes alike.

DISTRIBUTION : Found in winter as low as 2,500 feet up to 5,000 feet in summer. The factor which governs its choice of habitat in the breeding season is the presence of a waterfall.

GENERAL HABITS : Unlike the Western Spotted Forktail this species prefers turbulent streams and waterfalls flowing through open country. It is an exhilarating sight to watch one of these birds feeding on the face of a water-washed, almost perpendicular slab of rock. Its food consists of aquatic insects.

NIDIFICATION : Takes place about two weeks before the foregoing species. The nest is placed on a small ledge of rock, sometimes behind the apron of a waterfall. The nest is a compact little cup composed of fresh green moss lined with skeleton leaves. The eggs are apparently always 3 in number, white sparsely speckled with pale red.

65. **Phoenicurus frontalis** Vigors. The Blue-fronted Redstart.

LENGTH : 6½ inches.

FIELD CHARACTERS : Forehead and supercilium bright blue; head, back, wings and throat dark blue; rest of lower plumage and rump orange chestnut; central tail feathers black remainder chestnut with broad black tips. Female brown with tail and rump as in the male.

DISTRIBUTION : In the vicinity of Simla this is a winter visitor from October to March between elevations of 6,000 feet to 8,000 feet. In summer Waite found it at Chini, Pangi and above Nachar, and my son Paul found it on the higher slopes of the Chor mountain in June.

GENERAL HABITS : Usually found in forest but sometimes in open rocky country. The tail is flicked vertically rather than shivered. The note is *tit-tit-tit* very reminiscent of the European Redbreast. Insectivorous.

NIDIFICATION : There can be little doubt that it breeds in the higher hills of our district. Whistler found a nest containing 3 hard-set eggs above the Kareri Lake on the Daula Dhar range which is in Kangra District. The date was 7-6-23 it was placed in a cleft between some stones in a bank clothed with rough herbage. The eggs are dull pinkish-grey stippled all over with pale reddish.

66. **Phoenicurus erythronotus** (Eversm.) Eversmann's Redstart.

LENGTH : 6½ inches.

FIELD CHARACTERS : Male : crown, nape and hind neck pale ashy blue; forehead, lores, cheeks and chin black; rump and tail chestnut, the latter with the two central feathers dark brown; a broad white wing patch; throat, breast and flanks chestnut. Female : ashy brown with the rump and tail as the male.

DISTRIBUTION : A winter visitor to N. W. India and not uncommon from Peshawar to Dehra Ismail Khan. It has been recorded, years ago, from Kotkhai and I had a female sent to me from Tara Devi, 6,700 feet. These were probably storm-driven birds. Whistler has given us two records from Kangra, both occurrences in February.

GENERAL HABITS : A bird of lightly wooded country while in its winter quarters. It usually perches on one of the lower branches of a medium sized Kikar or Babul tree. The note is a creaking *greer*.

NIDIFICATION : Said to breed in Turkestan. The eggs are like those of the Indian Stone-Chat, though the markings are scattered over the surface—not forming a zone at the larger end. The recorded nest was in an old wall.

67. **Phoenicurus ochrurus phoenicuroides** (Horsfield & Moore). The Black Redstart.

LENGTH : 6 inches.

FIELD CHARACTERS : Male : forehead, sides of head, neck, chin, throat and breast black; crown and upper parts to rump ashy grey; rump and upper tail-coverts bright chestnut; central tail feathers brown, lateral tail feathers chestnut; underparts deep orange brown. Female: fulvous brown; rump and tail as in the male; lower plumage paler.

DISTRIBUTION: Breeds commonly in Ladakh, Lahul and Spiti and is very common in the plains of the Punjab in the winter, but only a rare passage migrant in the autumn in the Simla Hills.

GENERAL HABITS: A bird of lightly wooded country, gardens and buildings in the cold season; in its breeding habitat it frequents the most desolate country. The tail is shivered as the bird moves about.

NIDIFICATION: The breeding season is June. The nest is placed among the loose stones of walls or under stones on the hillsides. The materials consist of grass stems, moss and roots, lined with fine grass, hair and feathers. Two types of eggs are found: pale greenish-blue or almost white; the clutch consists of 4 to 6 eggs.

68. **Chaimarrhornis leucocephalus** (Vigors). The White-capped Redstart.

LENGTH: 7½ inches.

FIELD CHARACTERS: Crown glistening white; rest of head, back and wings black; rump, upper tail coverts and lower parts from breast rich chestnut; tail chestnut with broad black tips. Sexes alike.

DISTRIBUTION: A winter visitor to the immediate vicinity of Simla from 7,000 feet down to the foothills and some little distance into the plains. Otherwise from Baluchistan throughout the Himalayas to China up to 16,000 feet.

GENERAL HABITS: A water redstart. In Simla it is found on almost every stony nullah even in the town itself, i.e. Combermere Bridge; it may also perch on the roofs of houses in the immediate vicinity of water. The tail is raised above the line of the back in a series of measured jerks, much as the Bluethroat does. The call note is a high-pitched *tseeee*.

NIDIFICATION: Whistler tells us that the breeding season is from May till August and that most nests will be found in August. The nest is a deep, massive cup of moss, leaves, roots and grass, with a thick lining of wool and hair. The eggs number from 3 to 5. The ground colour is pale blue or blue-green marked with specks and spots of reddish brown.

69. **Rhyacornis fuliginosus fuliginosus** (Vigors). The Plumbeous Redstart.

LENGTH: 5 inches.

FIELD CHARACTERS: Male: whole plumage slaty-plumbeous except the tail which is rich chestnut. The female has the upper plumage dull brown, the tail broadly white at the base tipped broadly with brown; lower plumage ashy-white squamated with brown.

DISTRIBUTION: A common resident species about Simla with some slight seasonal movement. It breeds from 4,500 feet up to 9,000 feet or more. Strictly confined to the mountain streams.

GENERAL HABITS: This sprightly little bird is as much given to flycatching as feeding from the ground or snatching an insect from the surface of the stream. The tail is spread and gently wagged. The male has a vibrating trill for his song.

NIDIFICATION: Nest of this species are found from April to July and the species is double brooded. The nests are placed on a ledge of rock, in the bank of a stream or retaining wall close to a stream; they are built of grass-bents, moss and an occasional dead leaf or two and lined with fine roots, fibres, hair and wool. The eggs usually number 4 and are white tinged with pale greenish-blue with reddish-brown markings which usually form a zone at the large end.

70. **Cyanosylvia svecica pallidogularis** Sarudny. The Bluethroat.

LENGTH: 6 inches.

FIELD CHARACTERS: A brown bird which keeps inside cover near dampish localities. The male is distinguished by a bright blue throat and breast in the centre of which is a chestnut spot. Both sexes have a pale buff eye-stripe and underparts; the base of the tail is chestnut, very conspicuous in flight.

DISTRIBUTION: A rare passage migrant in these hills in October; C B. Ticehurst took one on October 16th 1919, while I obtained one at Basantpur, 3,500 feet 6th October 1918. During winter it is a very common bird in suitable localities in the plains.

General Habits: Usually seen solitary in moist localities, i.e. edges of jheels, even on a grass or rush-grown island and growing crops; its one requisite is cover but not in forest.

Nidification: Breeds in Ladakh in June and July. Both F. Ludlow and B. B. Osmaston took nests and eggs in that country. The nest is placed on the ground at the base of a bush or other shelter; grass, roots and leaves form the outer structure and it is lined with grass and fibres. The clutch numbers 4 eggs of a sage green colour sometimes freckled with pale red.

71. **Calliope pectoralis pectoralis** Gould. The Himalayan Rubythroat.

Length: 6 inches.

Field Characters: Forehead and supercilium white; upper plumage ashy washed with olive brown in winter plumage; the tips and base of tail feathers white; chin and throat bright crimson; breast black, lower parts white. The female lacks the crimson throat and chin and has these parts sullied white.

Distribution: Winter visitor from October to April. Ticehurst obtained one at Fagoo, 8,000 feet on 18-10-1919, while I got one in the same locality in 1920. Its winter quarters are mostly between 6,000 feet and 3,500 feet.

General Habits: A very retiring bird and rarely shows itself out in the open. It prefers fairly dense cover and for the most part feeds on the ground but will occasionally mount to the top of a bush for a few moments.

Nidification: Breeds in Kashmir, Gilgit and Ladakh during June and July. The nest is domed, placed on the ground and carefully secreted in bush-clad country; dry grass is the material commonly used. Eggs number 4 or 5 and are of a blue-green colour sometimes with a faint ring of reddish freckles at the larger end.

72. **Tarsiger chrysaeus whistleri** Ticehurst. The Simla Golden Bush-Robin.

Length: 6 inches.

Field Characters: Male, upper parts olive green; ear-coverts black; supercilium, rump and whole lower plumage bright orange. Female, duller than the male; ear-coverts olive brown.

Distribution: Winter visitor in small numbers to the lower elevations from 5,000 feet down to 2,500 feet, mostly in the Sutlej Valley. Otherwise from Hazara to Garhwal. Further East the typical race occurs.

General Habits: A bird of unobtrusive habits keeping to fairly dense undergrowth and hopping quietly about on the ground in search of food. Call-note a subdued croak.

Nidification: Breeds at higher elevations from May to July. The nest is placed on a sloping hillside in a niche in a bank among the herbage and rocks. It is composed mostly of moss and lined with hair and wool. The clutch usually consists of 4 eggs of a skim-milk blue.

73. **Ianthia cyanura pallidiora** Baker. The Kashmir Red-flanked Bush-Robin.

Length: 6 inches.

Field Characters: Male: upper plumage deep blue; chin, throat and upper breast sullied white; flanks orange chestnut; underparts ashy white. Female: above olive brown, otherwise much the same as the male.

Distribution: Common winter visitor. Arrives in October and may often be seen perching on the wire fencing aligning the quieter roads round Simla. It is a very hardy little bird and may be seen at 7,000 feet or more throughout the winter. It leaves for the higher altitudes in March. Waite took a juvenile at Baghi on June 22nd.

General Habits: A tame fearless little bird; its behaviour is very reminiscent of the British Redbreast. It feeds entirely on winged insects, taking the live ones in the air and the dead ones from the surface of the snow! While with us it haunts open spaces in and near forest. Its note is syllabilized by Whitehead as *prot,* which is a good representation.

Nidification: Breeds from May to July between 9,000 feet and 12,000 feet. The nest is made of dry grass, moss and leaves; lined with fine fibres and hair or fur. The eggs number from 3 to 5 and are spotless white, very rarely with a few small blotches of pale red-brown at the large end.

74. **Adelura coeruleocephala** (Vigors). The Blue-headed Robin.

LENGTH: 6 inches.

FIELD CHARACTERS: Male, crown and nape smalt blue; back, rump, tail, throat and breast black; a broad wing-bar, abdomen and under tail-coverts white. The female is brown with ferruginous rump; underparts paler brown.

DISTRIBUTION: Arrives in Simla (7,000 feet) during the latter half of October returning to higher elevations early in March. Waite frequently encountered it on the further reaches of the Hindustan-Tibet road from Urni to Pangi.

GENERAL HABITS: A common and fearless bird while in its winter quarters. It likes more open country than the last species and will frequently be seen on the bushes along the less crowded thoroughfares. One sees at least ten males to one female. Its food consists of winged insects. Its general demeanour is partly Redstart, partly Robin. The note is *tit-tit-tit* very much like the British Robin's.

NIDIFICATION: This species breeds in May and June between elevations of 8,000 feet and 12,000 feet. The nest is placed on the ground. It is made of moss, leaves and grass, lined with hair and fur. The clutch consists of 3 or 4 eggs. These are grey-blue with a ring of fine pale reddish specks at the larger end.

75. **Saxicoloides fulicata cambaiensis** (Latham). The Brown-backed Indian Robin.

LENGTH: 6½ inches.

FIELD CHARACTERS: Male: upper plumage earth brown, lesser wing-coverts white; throat to abdomen glossy black; under tail coverts chestnut. Female, brown above and below; lacks the black underparts and the white wing patch.

DISTRIBUTION: At the base of the hills up to 3,500 feet. Penetrates some distance up the Sutlej Valley. Resident. Elsewhere throughout the plains of Upper India. In S. India it is represented by other races.

GENERAL HABITS: A common familiar bird. Frequents open bushclad, rather arid and stony country. Keeps mostly to the ground delighting in rocky localities and human habitations. The tail is held high above the back and flicked from side to side. The song is mediocre. Food: insects and their larvae.

NIDIFICATION: The nest may be found from March to August. Any suitable hole or cranny in a wall, tree or a bank may be chosen for the nest. The materials are grass-bents lined with hair, fibres and wool. Eggs number 3 or 4 and are a pale green mottled with red-brown evenly distributed over the surface. An interesting characteristic is that most nests contain a fragment of snakes' skins.

76. **Copsychus saularis saularis** (Linnaeus). The Magpie Robin.

LENGTH: 8 inches.

FIELD CHARACTERS: Male: head, neck, upper plumage, breast wings and tail black; lower plumage white; a white patch on the wings and the outer tail feathers mostly white. Female: slaty grey where the male is black, remainder of plumage sullied white.

DISTRIBUTION: In the Simla Hills its usual habitat is from the foothills to 5,500 feet but it occasionally wanders up to 6,500 feet or slightly more. Elsewhere found practically throughout India.

GENERAL HABITS: Found mostly near cultivation and on the outskirts of lightly wooded country. Where it occurs it is tame and fearless. Perches freely on trees though most of its food is obtained on the ground. It has a beautiful song heard at its best early and late in the day. The tail is often cocked well above the level of the back.

NIDIFICATION: The breeding season in the hills is from May to July. Here the nest is often placed in a wide mouthed but shallow hole in an old walnut tree standing in cultivation. Any site from 6 feet to 15 feet from the ground may be utilised. The nest is a mere lining of the cavity, grass-bents and hair being the usual materials employed. The clutch usually consists of 4 eggs which are very pale green, fairly densely blotched with dark red-brown.

77. **Turdus merula maximus** Seebohm. The Central Asian Blackbird.

LENGTH: 11 inches.

FIELD CHARACTERS: Male; entire plumage black. Bill orange. Female; dark brown, slightly paler below. Bill dusky yellow.

DISTRIBUTION : In the Simla Hills this bird has only been recorded by H. W. Waite, (*J.B.N.H.S.*, Vol. 45, No. 4, p. 534), who collected a pair at Chini on June 1st. Outside our area thinly distributed from the N. W. Frontier to Bhutan.

GENERAL HABITS : A bird of the higher altitudes frequenting the upper limits of tree growth and the Alpine pastures where these are scarred with rocky gorges. Said to be a wild, shy bird.

NIDIFICATION : In the Himalayas it breeds in June and July making a substantial nest of moss and grass; it is placed sometimes on a ledge of rock or in a stunted Juniper tree. Eggs number 3 or 4, pale blue blotched with pale red-brown.

78. **Turdus albocinctus** Royle. The White-collared Blackbird.

LENGTH : 11 inches.

FIELD CHARACTERS : Male : a broad white collar, chin and throat white; remainder of plumage dark brown. Female : collar pale sullied earth brown; remainder of plumage rufous brown, slightly paler below.

DISTRIBUTION : In our area a few pairs used to breed near the top of Kufri Hill. Common in the Narkanda-Baghi area in summer. In a good Holly-berry season comes commonly into the outskirts of Simla, 6,500 feet to 7,500 feet.

GENERAL HABITS : A woodland species frequenting both light and heavy forest. Shy and wary in the breeding season; more confiding in the cold season when, if Holly berries are available, it may be seen feeding on these near the quieter thoroughfares. The only occasion I saw it on the ground was when an old one was feeding the newly-fledged brood on the top of Kufri Hill.

NIDIFICATION : The breeding season in the Simla Hills is in May and June. The only nest I have found was 8,400 feet on May 15th when it contained a single fresh egg. The nest was placed 10 feet from the ground in a fork of a Kharsu Oak. Materials and eggs are similar to those of the Central Asian Blackbird.

79. **Turdus boulboul** (Latham). The Grey-winged Blackbird.

LENGTH : 11 inches.

FIELD CHARACTERS : Sex for sex resembles the Central Asian Blackbird with the addition of a silvery grey patch on the wnig of the male and pale rufous in the female.

DISTRIBUTION : About the Simla area it is found up to 8,000 feet in summer, and down to the foothills in winter. I have even seen it some distance out in the plains, i.e. Ambala and Jagadhri City.

GENERAL HABITS : Not uncommon in the forests immediately surrounding our area. During the breeding season it is more often heard than seen. Morning and evening are the best times to hear the melodious song of the male for without any doubt he is considered our finest songster. It is of a shy retiring nature moving off quietly through the forest at the least hint of danger. Its food consists of insects, berries, fruit and earthworms.

NIDIFICATION : The breeding season is from the latter half of April to August. It is double brooded. The nest is made of moss, leaves, grass and tendrils with an interlining of mud and finally a lining of dry grass. It is placed in the fork or on an horizontal branch of a tree from 6 feet to 15 feet from the ground. The eggs are usually 3 or 4 in the clutch. The ground-colour is pale green blotched evenly over the surface with pale red-brown.

80. **Turdus rubrocanus rubrocanus** Gray. The Grey-headed Thrush.

LENGTH : 11 inches.

FIELD CHARACTERS : Head, neck and throat grey; back deep chestnut; rump and upper tail coverts bright chestnut; tail black; below chestnut, paler on abdomen. The female is a duller edition of this description.

DISTRIBUTION : Winter visitor to the Simla Hills when it may be seen in small flocks which arrive here late in October, leaving for higher elevations further West in March.

GENERAL HABITS : Very similar to those of the White-collared Blackbird with which it often consorts when both species are gorging themselves on Holly-berries.

NIDIFICATION : Not found breeding in our area but Colonel R. H. Rattray found numbers of its nests at Murree. He says the nests are placed in banks, holes in rocks, among roots of fallen trees and in a hole in a tree trunk up to 10 or 12 feet from the ground. Whistler quotes Hingston (*Ibis* 1926) as finding it a 'common and widespread resident breeding between 7,000 and 9,500 feet'. The breeding season is from April to June. The nest is made of the same materials as of the Grey-winged Blackbird; the eggs are also similar.

81. **Turdus atrogularis** Jarocki. The Black-throated Thrush.

LENGTH : 10 inches.

FIELD CHARACTERS : Male : upper parts, olive brown ; cheeks, chin, throat and breast black ; lower plumage white, under wing coverts dull orange brown. Female : above, similar to the male ; chin, throat and fore-neck heavily spotted with black ; remainder of lower plumage white.

DISTRIBUTION : A winter visitor in some numbers, flocks arriving at the end of October and leaving again in April and uncommonly even as late as the beginning of May, their movements being governed by weather conditions.

GENERAL HABITS : This species is highly gregarious, flocks of up to fifty birds being often seen at the time of their departure. Its usual call-note is similar to that of the British Song Thrush. The food consists of earthworms, insects and berries.

NIDIFICATION : Very doubtful if it has ever bred within Indian limits. Its chief breeding grounds being the 'Taiga' forests of Siberia. Nests and eggs resemble those of the several species of blackbirds.

82. **Turdus unicolor** Tickell. Tickell's Thrush.

LENGTH : 9 inches.

FIELD CHARACTERS : Male : upper plumage including wings and tail ashy-grey ; lower plumage slaty-grey, paler on the chin and becoming white towards the tail ; under wing-coverts chestnut-brown. Female : upper plumage olive brown ; chin and throat white, streaked with black on the sides ; breast olivaceous with a gorget of black spots across the upper part ; flanks ochraceous ; abdomen white ; under wing-coverts chestnut-brown (Whistler).

DISTRIBUTION : In the Simla Hills area it is a passage-migrant appearing in October in the lower hills to 7,000 feet before it passes on to its winter quarters in Central India. Not observed on the Spring migration. Very common in Kashmir during summer. Rare in the Kangra Valley during summer.

GENERAL HABITS : A quiet sombre coloured bird. Frequents the ground under groves of trees. When disturbed flies silently up into a nearby tree. In Kashmir it is commonly seen hopping about the lawns at Srinagar. It has a fine song during the breeding season. Food consists of insects, earthworms and berries.

NIDIFICATION : Does not breed in the Simla Hills area. The breeding season is said to be in May and June. The nest is composed of moss, roots and dry grass, lined with fine roots. It is placed in a tree from 6 feet to 20 feet from the ground. Rarely, a nest may be placed on the ground in a bank. The clutch numbers from 3 to 5 eggs, the ground-colour is pale green or reddish-white thickly speckled with dull reddish-brown.

83 **Arceuthornis viscivorus bonapartei** (Cabanis). The Himalayan Missel-Thrush.

LENGTH : 12 inches.

FIELD CHARACTERS : A large grey-brown bird ; lower plumage pale buff spotted with black. Sexes alike.

DISTRIBUTION : In the Simla Hills this fine Thrush is resident between 6,000 feet and 9,000 feet. The higher elevation is its summer habitat ; the lower its normal winter quarters unless snow drives it still lower. Whistler found it in Rawalpindi and I obtained one in Dehra Dun in winter.

GENERAL HABITS : A bird of the open downlands where it hops about the ground in its search for insects and berries. At the approach of danger it flies off with a churring note, settling again further afield. In the breeding season it withdraws to the edges of forest.

NIDIFICATION : The breeding season is from the beginning of May to June. The nest is placed in a fork of a tree at no great height from the ground : 8 feet to 15 feet up. A Kharsu oak or a deodar are the trees most favoured. The materials are grass-bents, dried stems of plants, lichen and moss, lined with fine grass and roots. The eggs number 3 or 4 and are pale stone in ground-colour boldly blotched with reddish-brown with some underlying markings of inky purple.

84. **Geokichla wardii** (Blyth). The Pied Ground-Thrush.

LENGTH : 9 inches.

FIELD CHARACTERS : Male : upper plumage and throat black ; a broad white supercilium ; underparts, tips of tail feathers and a wing bar white ; flanks barred with black. Female : above olive brown ; narrow fulvous supercilium ; chin white ; throat and upper breast fulvous-white barred black ; remainder of lower plumage white, heavily barred black on flanks.

DISTRIBUTION : The Sutlej Valley is its westerly limit of distribution and the bird is definitely very rare in our area. I have seen it between 6,000 feet and 8,000 feet in these hills. Eastward it extends to Assam and the Naga Hills.

GENERAL HABITS : This handsome bird's habitat is the edge of forest. It is a summer visitor arriving in early April and leaving for its winter quarters in September. The song is poor, being composed of two notes, otherwise it is a very silent bird.

NIDIFICATION : Takes place in May and June. A nest I found was placed in the fork of an horizontal branch of an Oak (*Q. incana*) at the edge of forest. The materials are moss, grass or leaves, lined with fibres and pine needles. The eggs number 3 or 4. The ground-colour is white tinged with green sparsely blotched with pale red-brown.

85. **Geokichla citrina citrina** (Latham). The Orange-headed Ground-Thrush.

LENGTH : 9 inches.

FIELD CHARACTERS : Male : head, neck and underparts bright orange-chestnut ; back, wings and tail bluish grey ; a white wing-bar. Female : like the male with the exception of the bluish-grey parts being replaced by olive-brown.

DISTRIBUTION : A summer visitor ; its habitat being groves of trees near human habitations and cultivated country between 3,000 feet and 5,500 feet. It is uncommon in our area. Beyond the Simla Hills boundaries this race is recorded from Murree to Assam. Other races occur in the C.P. and Western India down to Travancore, while both the Andaman and Nicobar Islands have their respective races.

GENERAL HABITS : Inhabits the lesser forests and groves which possess a plentiful undergrowth in which it finds its food. I have also seen it away from forest where it feeds on the ripe fruit of *Berberis*. Insects of all kinds, berries and fruit comprise its food. The song consists of a few pleasant notes.

NIDIFICATION : May and June are the principal months in which it breeds, though nests are occasionally found in July and August. The nest is cup-shaped, made of moss, leaves, grass and dead leaves and lined with dry grass and roots. It is placed at no great height from the ground. The clutch consists of 3 or 4 eggs pale green or stone colour, blotched and speckled with reddish-brown.

86. **Oreocincla dauma dauma** (Latham). The Small-billed Mountain-Thrush.

LENGTH : 10 inches.

FIELD CHARACTERS : Sexes alike. Above ochraceous brown each feather with with a black bar ; tail brown, tipped and edged with sullied white ; lower plumage white profusely spotted with black.

DISTRIBUTION : Comes into the neighbourhood of Simla in October, leaving again in March for higher altitudes. Waite obtained a young bird on Mount Hattu on June 24th.

GENERAL HABITS : A quiet, retiring bird generally seen hopping about the ground in forest, flying silently up into a tree when disturbed. A male I observed one summer at Kufri had a fine loud song, reminiscent of that of the British Song Thrush.

NIDIFICATION : We have no definite data regarding its breeding in our area though Waite's record of obtaining the juvenile (above) makes it practically certain that it does so Outside our area Rattray obtained nests at Murree. The *F.B.I.* (2nd edition) gives the breeding season as May and June and the nest as made of green moss mixed with roots, leaves and grass and lined with fine roots. It is placed from 5 feet to 10 feet from the ground. Eggs are either 3 or 4 in a clutch. In colour they are pale clay or yellowish-green closely freckled ever with pale reddish.

87. **Oreocincla mollissima simlaensis** Stuart Baker. The Plain-backed Mountain-Thrush.

LENGTH: 10 inches.

FIELD CHARACTERS: Upper parts olive-brown, unmarked; underparts the same as in the Small-billed Mountain-Thrush. Sexes alike.

DISTRIBUTION: A winter visitor. Rare. Outside our area from Kangra to Garhwal. Further east the typical race occurs. The race *O. m. whiteheadi* occurs at high altitudes on the N. W Frontier.

GENERAL HABITS: The same as the foregoing species.

NIDIFICATION: W. H. Matthews records a nest found by him in the Bhillung Valley, Tehri Garhwal (*J.B.N.H.S.*, Vol. 25, No. 3). He tells us that the nest was made of moss, lined with roots and fine grass. There were 4 fresh eggs on June 14th; they were whitish in ground colour, profusely spotted with chestnut and reddish-brown, in some cases almost blood red. The bird was a close sitter.

88. **Zoothera monticola** Vigors. The Large Brown Thrush.

LENGTH: 11 inches.

FIELD CHARACTERS: Sexes alike. Upper plumage, wings and tail dark ashy-brown; chin and throat white narrowly barred with dark brown; remaining lower parts fulvous to white heavily spotted with black. The scimitar-like bill is diagnostic.

DISTRIBUTION: The Sutlej Valley is the westerly limit. Neither Whistler nor Hingston seem to have encountered it in the Kangra Valley. Eastwards it is found through the Himalayas to Assam and Manipur.

GENERAL HABITS: Winter visitor to our area. Here it is found from 5,000 feet to 7,500 feet from November to March. Its habitat are the small mountain streams running through forest. It is a quiet bird, feeding on the damp margins of the water and which, on being disturbed, flies into a nearby tree. It is crepuscular.

NIDIFICATION: Takes place between the end of May and the beginning of July. The nest is placed from 10 feet to 20 feet from the ground. The exterior is made of fresh damp moss, the lining being of roots, lichen and rhizomorphs. The eggs number 3 or 4 and are of the blackbird type.

89. **Monticola rufiventris** (Jardine & Selby). The Chestnut-bellied Rock-Thrush

LENGTH: 9 inches.

FIELD CHARACTERS: Male: above brilliant cobalt-blue; chin and throat black; remainder of lower plumage dark chestnut. Female: the whole upper plumage including wings and tail faintly barred black; a ring round the eye and a crescentic fulvous area behind the eye and ear-coverts; chin and throat buff; the whole lower plumage buff, squamated with black. The young male in first plumage has the wings and tail blue; otherwise is like the female.

DISTRIBUTION: In summer found from 7,000 feet to 9,000 feet. During the winter months wanders down to the foothills and occasionally out into the plains (Ambala).

GENERAL HABITS: A forest bird. During the breeding season it is of a very shy, retiring nature, its presence being revealed either by the pleasant warbling song of the male or by the alarm note uttered by both birds when they are anxious for the safety of the nest or young ones. Insectivorous.

NIDIFICATION: The breeding season is from the end of April to the middle of May. Single brooded. The materials used for the nest are mainly dry grass on a foundation of fine twigs and is lined with roots and fine grass. The female only incubates and is a close sitter. The eggs number 3 or 4; in ground colour pale cream suffused with pink and finely but profusely freckled all over the surface with light red brown which usually forms a zone at the larger end.

90. **Monticola cinclorhyncha** (Vigors). The Blue-headed Rock-Thrush.

LENGTH: 8 inches.

FIELD CHARACTERS: Male; head, nape, chin and throat bright cobalt blue; a narrow eye-stripe, ear coverts, back and scapulars black; a broad white bar on the wing; rump, upper tail coverts and lower plumage chestnut. Female; upper plumage, wings and tail olive-brown; below white to fulvous, each feather squamated dark brown.

DISTRIBUTION : Summer visitor. Common from 4,000 feet to 7,000 feet. One of the few birds addicted to the pine (*P. longifolia*) forests in the hot dry weather.

GENERAL HABITS : A forest bird, arriving in the middle of April. Very secretive in its habits but the male may frequently be seen pouring out his pleasant little song from the topmost branch of a tree. It occasionally indulges in a volplaning flight, pouring out its song during this performance. Food : winged and other insects.

NIDIFICATION : Takes place from the end of April (exceptional), May and June. Otherwise both nest and eggs are similar, except that both are slightly smaller, to those of the foregoing species.

91. **Monticola solitaria pandoo** (Sykes). The Indian Blue Rock-Thrush.

LENGTH : 8 inches.

FIELD CHARACTERS : Male : the whole plumage dark blue. Female : above grey brown ; back and rump barred blackish ; below fulvous barred blackish.

DISTRIBUTION : In our area found mostly between 5,000 feet and 7,500 feet.

GENERAL HABITS : Summer visitor. Frequents the open, grassy, rocky, precipitous hillsides. Its melodious song is uttered from a commanding rock or telegraph pole. The food consists of grasshoppers and other winged insects captured on the ground. In September it begins to leave its summer quarters and descends to the foothills and plains. During summer it is extremely cautious in the vicinity of the nest but in winter is a tame confiding bird even haunting and roosting in human habitations.

NIDIFICATION : May is the month in which most nests will be found. These are well concealed in the crevice of a small crag or in a built-up wall made of slabs of rock. The nest is composed of grass and roots, lined with hair and fine roots. The eggs number 3 or 4 and are pale blue usually with a few rust coloured blotches scattered over the surface.

92. **Myiophoneus caeruleus temminckii** Vigors. The Himalayan Whistling-Thrush.

LENGTH : 12 inches.

FIELD CHARACTERS : A large black thrush tinged with deep ultramarine, each feather is tipped with light shining blue. Sexes alike. Common resident.

DISTRIBUTION : Found in our area from 2,500 feet to 9,000 feet, even higher at times. A typical hill bird found throughout the Himalayas. Represented by other races in South India and Burma.

GENERAL HABITS : One of our most conspicuous birds frequenting alike the wild turbulent streams, the small cliffs and crags in the jungles and the bungalows of the township where its joyous song is uttered almost throughout the year. Irrepressible and virile, I have heard it singing during a sharp hailstorm ! Often sings on the wing and has a habit of fanning its tail as it alights on its perch. Its usual call-note is exactly like that of the Spotted Forktail, besides which it has some very harsh ones. Earthworms, caterpillars and water insects constitute its usual diet but it will eat almost anything it finds.

NIDIFICATION : The breeding season is from the end of April to July. It is double-brooded. A pair which built in our verandah in 1946 laid the second clutch 11 days after the young of the first brood left the nest. The situation of the nest is usually in a cliff near a mountain stream, rarely in a tree and not uncommonly about our bungalows. The materials used are green moss and lined with roots. The clutch numbers 3 or 4 eggs which are very pale blue suffused in light rust, some may even be distinctly marked though this is exceptional.

93. **Laiscopus collaris whymperi** Stuart Baker. The Central-Himalayan Alpine Accentor.

LENGTH : 6 inches.

FIELD CHARACTERS : Forehead to hind-neck greyish brown ; back more rufous with broad black centres to each feather ; rump and upper tail-coverts rufous ; tail dark brown tipped white, as are also the lesser wing coverts ; chin and throat white barred with black ; breast greyish brown ; flanks and underparts deep chestnut. Sexes alike.

DISTRIBUTION : It is a winter visitor to the immediate neighbourhood of Simla from November to March, but breeds above Chini whence I received an immature specimen sent to me in August 1926.

General Habits : A very quiet bird with us. Nearly always found in pairs frequenting rocky country in forest or open country. Absolutely tame and fearless. Feeds on insects and grass-seed.

Nidification : We are indebted to the late S. L. Whymper for a description of this bird's nesting habits. He found the nests at an elevation of 15,000 feet in Garhwal; these were composed entirely of moss and placed under the shelter of a rock. The eggs number 2 or 3 of the usual Hedge-Sparrow blue, unmarked.

94. **Laiscopus himalayanus** (Blyth). The Altai Accentor.

Length : 6 inches.

Field Characters : Differs from the foregoing species in being more rufous on the back; a gorget of white on chin and throat; flanks rufous, each feather edged whitish. Sexes alike.

Distribution : This is another winter visitor to the Simla Hills, where it may be observed from 6,000 feet to 8,500 feet from the end of October to the end of March.

General Habits : Highly gregarious in its winter habitat; flocks of 50 to 60 or more are not uncommon. They feed on the barer hillsides, always preferring the shady side of the hill. Towards the end of their sojourn with us an incessant warbling is indulged in either while searching the ground for food or when perched in a leafless tree.

Nidification : Said to breed in Gilgit, Ladakh and Tibet in May, June and July between 12,000 feet and 15,000 feet. The nest and eggs are similar to those of the Alpine Accentor.

95. **Prunella atrogulurs** (Brandt). The Black-throated Accentor.

Length : 6 inches.

Field Characters : Above dark brown, feathers on the back centered black; tail brown; a broad buff supercilium; ear-coverts, chin and throat black; breast and flanks ochraceous buff. Sexes alike.

Distribution : Winter visitor from October to April. It is found in our area from the foothills to 9,000 feet.

General Habits : Found for the most part on scrub-covered hillsides where it forages about in the herbage around the base of bushes. Has a habit of flicking its wings as it moves about. The call-note is a soft *trrt*.

Nidification : We have no authentic instance of its having bred in India but the *F.B.I.* (2nd edition), tells us it is 'not an uncommon breeding bird in Tibet from 12,000 feet to above 14,000 feet. The nest is placed low down in a thorn bush and the clutch numbers either 3 or 4 eggs which are indistinguishable from other species of the sub-family'.

96. **Prunella strophiata jerdoni** (Brooks). Jerdon's Accentor.

Length : 6 inches.

Field Characters : The whole upper plumage brown tinged with rufous, each feather broadly centered blackish brown; a broad supercilium, cream in front shading to rufous towards the nape; chin and throat white spotted with black at the sides and base; breast rufous; abdomen white boldly streaked with black.

Distribution : This bird is a winter visitor to the Simla area but breeds in the interior from 9,000 feet upwards. H. W. Waite records, *J.B.N.H.S.*, Vol. 45, No. 4, obtaining an adult male and a juvenile at the beginning of June. A number wander down towards the foothills.

General Habits : Very similar to those of the Black-throated Accentor; if there is a difference it is that Jerdon's shows a partiality for a moister habitat.

Nidification : The nest is placed in a bush or a tree at a moderate height from the ground, preferably a conifer. The materials used are moss and dry grass and lined with fur and hair. The eggs usually number from 4 to 5 and are of the usual unspotted Hedge-Sparrow blue.

(In my former list I recorded the Robin Accentor (*P. rubeculoides*) but as no confirmatory evidence has since occurred it should be omitted from the present notes.)

97. **Muscicapa striata neumanni** Poche. The Eastern Spotted Flycatcher.

LENGTH: 6 inches.

FIELD CHARACTERS: Sexes alike. Upper parts including head, nape, back and wings greyish brown; a pale ring round the eye; lower plumage sullied white, streaked with brown on breast and flanks.

DISTRIBUTION: A very rare passage migrant to our area in early September. A. O. Hume obtained one in Jakko many years ago and I saw one on Elysium Hill in September 1933. Outside our area it is not uncommon on migration in the Western Punjab.

GENERAL HABITS: A stolid, quiet bird as a rule feeding from a fixed perch, returning again and again to the same branch after every flight after insects. It is quite indifferent to being watched.

NIDIFICATION: The breeding season is in May and June; the nest is made of grass, moss and roots, lined with hair, fine roots and hair and is placed in a variety of situations, i.e. on a branch of a tree, in a hole, against the side of a house etc. The eggs number 4 or 5, the ground colour is a pale sea-green which is heavily blotched with pale red often forming a broad zone round the large end.

98. **Hemichelidon sibirica gulmergi** Stuart Baker. The Sooty Flycatcher.

LENGTH: 5½ inches.

FIELD CHARACTERS: Above, sooty brown; sides of head mottled brown and white; breast and flanks sooty brown; abdomen white. The pale buff ring round the eye is noticeable.

DISTRIBUTION: Summer visitor arriving at the end of April, leaving these parts in October. In its summer quarters it is found from 6,000 feet to 9,500 feet. Much more in evidence on its downward migration when its numbers are much augmented by immigrants from higher altitudes.

GENERAL HABITS: Very similar to those of the Spotted Flycatcher. It is, however, more of a forest bird, particularly affecting the deodar tracts.

NIDIFICATION: Breeds from May to June, usually placing its nest on a horizontal branch of a moss-grown deodar. The height from the ground is from 8 feet to 60 feet. For the size of the bird the nest is rather large on the exterior but the interior is small and deep. Outside it is almost entirely composed of moss with a flake or two of lichen, the lining being of fur or hair with an occasional feather. The eggs number 2 or 3; in colour they are pale green, densely clouded over with pale rust colour so that the ground colour is practically obscured.

99. **Siphia strophiata strophiata** Hodgson. The Orange-gorgeted Flycatcher.

LENGTH: 5½ inches.

FIELD CHARACTERS: Upper plumage olive brown; tail black with white bases; forehead black, next to which follows a white band which is prolonged to the eye; breast and throat deep slaty centred with orange; abdomen white.

DISTRIBUTION: Found from the foothills in winter to 9,500 feet in summer. Outside our area from Kashmir to Assam.

GENERAL HABITS: A forest bird frequenting the lower canopy flitting from bush to bush at no great height from the ground. During the breeding season it is shy and retiring but in its winter quarters is bold and inquisitive; the note at this season is a low *tuck-tuck-tuck*.

NIDIFICATION: Takes place from the end of April to June. The nest is made of moss, maiden-hair fern rachides lined with the latter, a feather or two and fragments of birch bark. The situation chosen may be on the ground on a sloping bank or in a convenient hole of a tree up to a height of 10 feet. The eggs number 3 or 4 and are pure glossy white.

100. **Siphia parva parva** (Bechstein). The European Red-breasted Flycatcher.

LENGTH: 5 inches.

FIELD CHARACTERS: Forehead, crown and nape ashy-grey; back, scapulars and wing coverts fulvous brown; upper tail coverts and tail black, the outer ones with the basal two-thirds white; a ring of fulvous feathers round the eye; chin, throat and breast bright chestnut; remainder of lower plumage white. Females and young males lack the chestnut, otherwise resembling the adult male.

DISTRIBUTION : In our area a very rare passage migrant during the downward movement to the plains. It is noteworthy that there was a female or a juvenile male in our garden the morning after a severe thunder storm; this was on 27-10-46. It stayed with us for 3 days. Very common in the plains during winter. In summer to Central Europe and Western Siberia.

GENERAL HABITS : A tame familiar little bird during the winter months, when its visits almost every garden in the plains of Upper India. Its creaky note is often accompanied by raising and spreading the tail.

NIDIFICATION : May and June are reported to be the period during which breeding takes place. The nest is made of moss, grass and lichen lined with hair and grass. It is placed against a tree trunk or a wall and sometimes in a natural hole in a tree. The eggs number from 3 to 5. They are pale sea green, profusely marked with pinkish brown.

101. **Muscicapula tricolor tricolor** (Hodgson). The Slaty-blue Flycatcher.

LENGTH : 5 inches.

FIELD CHARACTERS : Adult male—deep slaty-blue above; forehead and supercilium paler and brighter; lower plumage sullied white; often tinged with fulvous on flanks and breast. Female above, olive-brown tinged rufous; upper tail-coverts and tail ferruginous; lower plumage fulvous white.

DISTRIBUTION : Found in summer between 7,500 feet and 9,500 feet. In winter descends to the foothills at elevations between 1,000 feet and 3,000 feet. Outside our area from Kashmir to Assam.

GENERAL HABITS : During the breeding season frequents the understorey in forest where cover is plentiful. Both its demeanour and notes are reminiscent of the British Redbreast.

NIDIFICATION : May and June are the months during which breeding takes place in our area. The nest is situated on the ground in a bank in forest; also said to be placed in a hole in a tree or in a wall. The material used is green moss with a sparse lining of the finest rhizomorphs. The eggs number 3 or 4 and are pale pinkish cream.

102. **Muscicapula superciliaris superciliaris** Jerdon. The White-browed Blue Flycatcher.

LENGTH : 5 inches.

FIELD CHARACTERS : Adult male: upper plumage deep ultramarine; a conspicuous white supercilium; sides of head, neck and breast indigo; remainder of underparts white. Female: above olive grey; rump and upper tail-coverts tinged blue; lower plumage pale buff.

DISTRIBUTION : A very common summer visitor to our area between 5,000 feet and 8,500 feet. It is found from the Afghan Frontier to Western Nepal. In winter it is found as far south as the C. P., Bombay Presidency and once in Mysore territory (Sálim Ali).

GENERAL HABITS : While in these parts it frequents open forest, being one of our birds which often makes use of the telegraph wires along the road-sides. It feeds mostly among the foliage of trees, not venturing much into the open. Entirely insectivorous as are all flycatchers.

NIDIFICATION : From the middle of April to the end of May the nest may be found from 3 to 24 feet from the ground placed either in a steep bank or a niche in a tree, often an ivy-covered one. The foundation of the nest is of green moss mixed with a few strands of fine grass lined sparsely with rhizomorphs, a few fragments of black roots (?moss) and a little horse-hair. Eggs 3 or 4 pale blue overlaid all over the surface with olive brown.

103. **Muscicapula rubeculoides rubeculoides** (Vigors). The Blue-throated Flycatcher.

LENGTH : 6 inches.

FIELD CHARACTERS : Adult male: upper parts, chin and throat deep indigo blue; breast and abdomen bright rufous. Female: olive brown, paler below, tail and rump tinged rufous.

DISTRIBUTION : Said to be from the Kashmir country throughout the Himalayas to Burma and on to Yunnan down to Siam and Cochin China.

GENERAL HABITS : A summer visitor to our lower hills and valleys from the foothills up to 5,000 feet. In habits it is somewhat skulking and must have ample cover wherever it takes up its abode. Its song is loud and full, but short.

NIDIFICATION: The breeding season of this species is rather protracted, i.e. from May to July. The nests are made of grass-bents and moss and lined with fine roots and hair. The situation is in a bank or a niche in a tree or an old stump. The eggs usually number 4 and in colour much resemble those of the last species.

104 **Eumyias thalassina thalassina** (Swainson). The Verditer Flycatcher.

LENGTH: 6 inches.

FIELD CHARACTERS: Colour verditer blue throughout, except the black eye streak; the female is slightly duller than her mate.

DISTRIBUTION: Very similar to the foregoing species (*M. rubeculoides*).

GENERAL HABITS: Summer visitor arriving early in March and leaving again in September and October. It inhabits a higher zone than the Blue-throated Flycatcher, between 5,500 feet to 9,000 feet. It is common and familiar though far from conspicuous when seated quietly amidst the foliage of a tree. The song is a sweet little warble.

NIDIFICATION: Takes place from April to July and it is probably double-brooded. The nest is built entirely of green moss and is placed in a well sheltered situation such as an overhanging bank along some quiet thoroughfare, in forest or in a verandah. Eggs usually number 4 and are of a pale salmon-pink in colour.

105. **Muscicapa latirostris** Raffles. The Indian Brown Flycatcher.

LENGTH: 5½ inches.

FIELD CHARACTERS: Sexes alike. Ashy-brown above; below sullied white, breast and flanks streaked ashy-brown.

DISTRIBUTION: The whole of India and Ceylon to the outer Himalayas.

GENERAL HABITS: A spring and summer visitor to the lower slopes of the Himalayas up at least 5,000 feet. A very quiet, stolid bird frequenting small groves of trees near cultivation.

NIDIFICATION: May and June are the breeding months. The nest is a compact cup made principally of moss decorated with lichen and lined with fine roots and fibres. The situation may be from 5 to 30 feet from the ground. Eggs number 3 or 4 and are pale green or pale blue in ground colour, which is heavily overlaid sienna brown so that they appear to be a uniform olive-brown.

106. **Muscicapa ruficaudus** Swainson. The Rufous-tailed Flycatcher.

LENGTH: 5½ inches.

FIELD CHARACTERS: Sexes alike. Above rufescent olive brown, rump and tail chestnut; below ashy-brown paler on abdomen.

DISTRIBUTION: From Baluchistan, Gilgit, Kashmir along the Himalayas as far east as Garhwal. In winter recorded from the C. P. and Travancore.

GENERAL HABITS: Spring and autumn passage migrant passing through Simla on the upward migration in April and on the downward passage in September. Hereabouts it is fairly common about 7,000 feet, its presence being proclaimed by its cheery warbling call note. Arboreal.

NIDIFICATION: Breeds commonly in Kashmir between 7,000 feet and 10,000 feet in May and June. The nest is similar to that of the last species. The eggs, 3 or 4 in number, are pale sea-green densely freckled all over with reddish.

107. **Culicicapa ceylonensis pallidior** Ticehurst. The Grey-headed Flycatcher.

LENGTH: 5 inches.

FIELD CHARACTERS: Sexes alike. Head, neck, throat and breast ashy-grey; above yellowish green, brighter on rump; under plumage bright yellow.

DISTRIBUTION: From Ceylon to the Himalayas. Rare in Sind where I saw one at Sukkur in the winter of 1937; in the plains of the Punjab it is not uncommon in the Ambala-Jagadhri area during the cold weather when it may be found frequenting mango groves.

GENERAL HABITS: The Grey-headed Flycatcher is one of our earliest summer visitors to arrive at these elevations, i.e. 6,000 feet to 8,000 feet, above which I have not observed it. Tame and confiding it may often be seen making use of the telegraph wires around the town. Has a cheery call of 4 (sometimes 5) notes scarcely amounting to a song.

NIDIFICATION: April, May and June are the breeding months. The nest is made of green moss, lichen and cobwebs and is usually unlined. The structure is bib-shaped and placed against the trunk of a moss-grown tree or rock. The eggs, usually 4 in number, are pale buff with a distinct zone of olive-brown and inky-purple.

108. **Nilava sundara fastuosa** (Lesson). The Rufous-bellied Niltava.

LENGTH : 6 inches.

FIELD CHARACTERS : Male : upper parts bright cobalt blue, the characteristic Niltava patch on each side of the neck a brighter metallic blue ; chin and throat black, tinged with blue in certain lights ; remainder of under parts bright orange-chestnut. Female : upper plumage fulvous-brown ; tail chestnut. The same metallic patch on the sides of the neck as in the male ; base of throat white ; remainder of lower parts olive-brown.

DISTRIBUTION : Himalayas, from Kangra to Kumaon.

GENERAL HABITS : A woodland species where it frequents the under storey ; a shy retiring bird whose harsh scolding note is the first indication of its presence. Breeding from 6,000 feet to 8,000 feet, it descends to the foothills in winter.

NIDIFICATION : May and June are the months in which nests may be found. These are placed on the ground on a sloping bank, well concealed by grass. The nest as well as the shape and colour of the eggs, are very reminiscent of the European Redbreast. The clutch consists of 4 : cream coloured and profusely speckled with chestnut.

109. **Tchitrea paradisi leucogaster** (Swainson). The Paradise Flycatcher.

LENGTH : Male 18 inches ; female 9 inches.

FIELD CHARACTERS : Older males : head and throat glossy black, remainder of plumage, including the elongated tail feathers, white. Younger males and females have chestnut upper plumage, the latter without tail ribbons.

DISTRIBUTION : In our area found from the foothills up to 6,000 feet. (Annandale). Whistler found it fairly common in this zone about Dharamsala.

GENERAL HABITS : This is a summer visitor to these parts where it is not uncommon about the less heavily forested country, a favourite haunt being near a small stream. It has quite a loud call-note, ? to counteract the noise of running water ; the attempt at song is just a jumble of notes.

NIDIFICATION : The breeding season is in May and June. The nest is a wonderful structure composed of grass-bents profusely smeared on the exterior with spiders' web. In shape it is an inverted cone. The clutch consists of 3 or 4 eggs which are cream coloured, marked with blotches of chestnut and inky-purple.

110. **Chelidorhynx hypoxanthum** (Blyth). The Yellow-bellied Flycatcher.

LENGTH : 5 inches.

FIELD CHARACTERS : Upper plumage olive brown ; forehead, a broad supercilium and whole lower plumage bright yellow ; ear-coverts black. The shafts of the tail feathers white.

DISTRIBUTION : This is a Himalayan species which, in winter, occasionally wanders some distance into the plains but normally is found at that season at the foot of the hills. In summer it ascends to 14,000 feet. Found from Kangra along the Himalayas as far as Lower Burma.

GENERAL HABITS : This lively little sprite has all the habits and antics of the Fantail Flycatcher (*Rhipidura*) i.e. fanning the tail, drooping the wings and short sallies after winged insects. A forest bird, with a sweet little song.

NIDIFICATION : June would appear to be the only month in which eggs have been found ; the number in a clutch does not seem to have been stated but probably would be 3 or 4. The nest is placed on a horizontal branch at moderate height from the ground ; it is a straight-sided little cup made of green moss lined with moss fruits with their stems attached. The colour of the eggs is cream speckled with reddish which tends to form a zone round the larger end.

111. **Rhipidura aureola aureola** Lesson. The White-browed Fantail Flycatcher.

LENGTH : 7 inches.

FIELD CHARACTERS : Sexes practically alike except that the female is slightly paler above. The forehead and a broad supercilium white ; ear-coverts and crown black, shading to blackish brown on the back. Tail feathers broadly tipped white ; wing-coverts tipped white ; chin and throat black, remainder of lower plumage white.

Distribution : In the Simla Hills not seen above 3,500 feet. (On the Sabathu Road), and quite uncommon though plentiful out in the contiguous plains country.

General Habits : Except that it is found in more open country than the foregoing species, its habits need no separate description.

Nidification : Takes place from March to August. The nest is made of grass-bents smeared profusely on the outside with spiders' webs and eggs-sacks and lined with grass fibres. The eggs normally number 3. The ground colour is buff to cream with a zone of greyish-brown markings at the larger end.

112. **Rhipidura albicollis** Vieillot. The White-throated Fantail Flycatcher.

Length : 7½ inches.

Field Characters : A short supercilium, chin and tips of the tail-feathers white; remainder of plumage sooty-black. Sexes alike.

Distribution : From the foot of the Hills (winter) to 6,500 feet (summer). This is a Himalayan species and occurs from Murree to Burma and still further East.

General Habits : These differ in no way from those of the last species. Found in the Pine (*P. longifolia*) forests up to 6,500 feet in the outer ranges, also in secondary scrub jungle especially where a small stream is at hand. Tame and fearless.

Nidification : May, June and July constitute the breeding season. The nest is exactly like the foregoing species, the eggs too are similar but as a general rule the ground colour is somewhat deeper in tint.

113. **Lanius vittatus** Valenciennes. The Bay-backed Shrike.

Length : 7 inches.

Field Characters : Forehead, anterior crown, a broad band produced behind the ear-coverts black; posterior crown white or pale grey on the nape and hind neck; back deep chestnut-maroon; wings black with a white patch; tail black with white outer edges; lower parts white suffused buff on breast and flanks. Sexes alike.

Distribution : Almost the whole of India; ascends the Himalayas up to 5,500 feet.

General Habits : This handsome little shrike is a bird of the more open hillsides in the neighbourhood of cultivation. Its food consists mostly of insects, small lizards, and occasional mice and young birds. It is a good mimic, at times utters a sweet short song but is capable of giving vent to some very harsh notes.

Nidification : In the Himalayas the breeding season is May and June. The nest is placed in a bush or small tree at no great height from the ground. It is a neat compact cup of grass stems thickly smeared with cobwebs on the outside, lined with fibres. Eggs usually number 4; the ground colour is buff or stone colour with a well-marked zone of brown and purplish blotches.

114. **Lanius schach erythronotus** (Vigors). The Rufous-backed Shrike.

Length : 10 inches.

Field Characters : Upper parts pale ashy-grey with rufous rump; forehead and eye-stripe black; tail black with rufous edges; wing black with a white patch at the base of the primaries; underparts white, washed rufous on the flanks. Sexes alike.

Distribution : Resident in the Simla Hills up to 6,000 feet, descending in winter to somewhat lower levels.

General Habits : A bird of the cultivated areas. Its food and general habits practically the same as the Bay-backed Shrike. Also a good mimic.

Nidification : May and June are the principal breeding months. The nest is composed of grass-bents and dry plant stems and is lined with fine grass fibre. It is massive and untidy, but well concealed by the foliage of some small tree, usually at no great height from the ground. The clutch often consists of 6 eggs which are pale cream with a zone of brown and purple blotches near the large end.

115. **Hemipus picatus capitalis** (Horsfield). The Brown-backed Pied Shrike.

Length : 5½ inches.

Field Characters : Upper parts either glossy black or dark brown, the feathers on the lower back and rump edged white. Tail black, the feathers tipped and edged white; wing black with a broad white band; underparts mostly white which, from the breast to under the tail-coverts, tinged fulvous.

DISTRIBUTION: The *Fauna of British India Birds,* (2nd edition pp. 367) gives this as from Kumaon eastwards to China. Since the publication of that work I have found it rarely about the Koti area, 3,000 feet above Kalka (4-4-26 and 10-2-31). Moreover, I would consider it common at Dehra Dun, Garhwal, 2,500 feet.

GENERAL HABITS: Gregarious in winter going about in flocks hunting through the forest and keeping near the tops of trees. Those I obtained in the Simla District were in pairs, it being near the breeding season. Has a pleasant high-pitched trilling call, in character much like the Common Wood-Shrike.

NIDIFICATION: The breeding season is said to be from April to June. The nest is a small, shallow saucer placed on the upper side of a branch and is difficult to see. It is composed mainly of fine grass with an admixture of moss and lichen strongly bound together with cobwebs. The clutch is either of 2 or 3. The eggs are pale greenish white boldly blotched with inky-black.

116. **Tephrodornis pondicerianus pallidus** Ticehurst. The Sind Wood-Shrike.

LENGTH: 6 inches.

FIELD CHARACTERS: Upper parts ashy-brown. A broad supercilium buff; ear-coverts and cheeks dark brown; tail dark brown edged white on the outer feathers; underparts pale ashy grey; white on abdomen and lower tail-coverts. Sexes alike.

DISTRIBUTION: Resident in the lower hills up to 3,000 feet. Outside our area this race is found in the Punjab and Sind.

GENERAL HABITS: Groves and avenues are its usual habitat where the pairs and parties move from tree to tree in their search for insects. It is a common, unobtrusive bird. Some of its notes are sweet and flute-like.

NIDIFICATION: The breeding season of this Wood-Shrike is from the end of February to June. The nest is a neat cup made of grass, smeared exteriorly with cobweb. The eggs number from 2 to 4, but the usual clutch is 3. In colour they are cream profusely blotched with pale nut-brown or reddish-brown.

117. **Pericrocotus brevirostris brevirostris** (Vigors). The Short-billed Minivet.

LENGTH: 7 inches.

FIELD CHARACTERS: Male; upper plumage to middle back, chin and throat glossy black; remainder of body plumage scarlet. Wings black with a broad band of scarlet; central tail feathers black, the others mainly scarlet with black bases. Female: forehead greenish-yellow, shading into the olive-grey of the upper plumage; rump and upper tail feathers sulphur yellow; lower plumage bright yellow; wing and tail as in the male but the scarlet replaced by yellow. Occasionally females may be seen in orange instead of yellow.

DISTRIBUTION: Arboreal. In summer found mostly between 6,000 feet and 9,000 feet. In winter I have seen it at Jubbulpore in the C.P.

GENERAL HABITS: The autumnal movements of this bird, mostly in a S.E. direction, are a feature in the ornithological sights of these hills, when huge flocks composed of both sexes may be seen moving leisurely from tree to tree or crossing an open space to another patch of forest. It is entirely insectivorous.

NIDIFICATION: From early April to the end of June would appear to be the breeding season. The nest is a beautiful little cup made of grass-bents bound together with spiders' web and plastered thickly on the outside with lichen. There is no real lining to the nest. The eggs usually number 3 or 4; the ground colour is pale green usually heavily blotched with chocolate brown. The nest is placed towards the extremity of a horizontal branch.

N.B. The Scarlet Minivet (*P. speciosus*) is said by many authors to occur as far west as the Sutlej Valley. I can only say that forty years' search in these hills has been unsuccessful where the writer is concerned, and it is a bird not easily overlooked.

118. **Pericrocotus roseus roseus** (Vieillot). The Rosy Minivet.

LENGTH: 7 inches.

FIELD CHARACTERS: Male: upper parts ashy-brown; rump and upper tail-coverts rosy-pink; wings and tail much the same as the preceding bird except that the scarlet in that bird is replaced by deep pink; undersides from chin to vent rosy-pink. Female: above neutral olive-green and the rosy-red of the male replaced by pale yellow.

DISTRIBUTION: During the summer months found up to 5,000 feet in the Simla Hills. Outside our area found from the Hazara country to Assam and Burma.

GENERAL HABITS: A summer visitor, when it occurs uncommonly in more open country (Solan, Sabathu), than the Short-billed. In autumn the bird is gregarious and the flocks move in a S. E. direction during September and October. Arboreal and insectivorous.

NIDIFICATION: Much the same as *P. brevirostris*. Nest not so profusely decorated with lichen. May 26th nest 30 feet from the ground in a *toon* tree; eggs 4; markings pale red-brown.

119. **Pericrocotus peregrinus peregrinus** (Linnaeus). The Small Minivet.

LENGTH: 6 inches.

FIELD CHARACTERS: Male: upper plumage grey; rump flame-coloured; wings dark brown with a central patch flame-colour; tail dark brown broadly tipped flame-colour; lores, chin, throat and sides of head dark grey; breast flame-coloured paling to fulvescent at the vent. Female: ashy-brown above; chin, throat and underparts white tinged with buff.

DISTRIBUTION: Resident in the lower Hills up to 3,000 feet. Found practically throughout India with geographical races.

GENERAL HABITS: Uncommon in these Hills going about in small parties that hunt through the upper branches of the trees uttering from time to time a high-pitched little squeak. The young males of the previous year breed in the female plumage, as do both the Short-billed and Rosy Minivets.

NIDIFICATION: The breeding season is mostly from March to June. The nest is placed on the top of a horizontal branch of a tree and is a beautiful little shallow cup made of fine grass bound together with spiders' web and decorated with scraps of bark and dead leaves. Eggs number 3 or 4, pale blue with blotches of red-brown which in some tend to form a zone at the broad end.

120. **Lalage melaschista melaschista** (Hodgs.) The Dark Grey Cuckoo Shrike.

LENGTH: 9 inches.

FIELD CHARACTERS: A dark, bluish-grey bird with a dark eye-stripe; wings black; tail black, each feather tipped white. Sexes alike.

DISTRIBUTION: Summer visitor to the Simla Hills ascending to a height of 6,000 feet.

GENERAL HABITS: A forest bird, also frequenting groves of trees about the cultivated hillsides. Has a sweet call of five notes *pity to be be*, uttered from a branch or while on the wing. Purposeful flight. Insectivorous.

NIDIFICATION: May and June constitute the breeding season. The nest is a most extraordinary structure made almost entirely of caterpillars' web with the droppings of these creatures still adhering to and decorating the exterior, a few flakes of lichen are sometimes used. The eggs, 2 or 3 in number, are pale, olive-grey blotched all over the surface with pale inky-brown.

121. **Graucalus javensis nipalensis** Hodgs. The Large Cuckoo-Shrike.

LENGTH: 11 inches.

FIELD CHARACTERS: Whole upper plumage pale grey; lores and ear-coverts dark grey; wings and tail ashy-brown, the latter tipped creamy-white; underparts paler grey shading to white on the abdomen and under-tail-coverts. Female: slightly paler than the male with obsolescent barring on the flanks.

DISTRIBUTION: Found sparingly along the foot of the Hills during the spring migration (February and March) where they may be seen singly working their way in a N. W. direction. Not observed after March.

GENERAL HABITS: Arboreal. Its food consists mainly of insects and their larvae and fruit, i.e. Pipal and Banyan. Its movements are somewhat heavy either in a tree or in flight. The usual call note is a loud parrot-like screech.

NIDIFICATION: Information as to season lacking, but probably April would be the principal month. The nest is said to be much the same as that of the Dark Grey Cuckoo-Shrike, as are the eggs, though in both respects much larger. The situation of the nest is well towards the extremity of a branch.

122. **Artamus fuscus** Vieillot. The Ashy Swallow-Shrike.

LENGTH : 7 inches.

FIELD CHARACTERS : Sexes alike. Upper parts ashy-grey shading to vinous brown on the back ; tail-coverts white ; tail slaty-black tipped with white ; under parts vinous-brown, paler on the abdomen ; under tail-coverts white. Iris blood red. blood red.

DISTRIBUTION : Of very rare occurrence in these Hills. The honour of its discovery in these Hills belongs to my friend S. Basil Edwardes who found a small party of this bird near Solan. The one specimen he collected came into my own collection and is now in the B.N.H. Society's collection.

GENERAL HABITS : Gregarious and insectivorous, catching all their food on the wing. The flight is buoyant and graceful.

NIDIFICATION : April, May and June are said to be the principal months in which their nests may be found. This is rather a flimsy structure mainly composed of roots and fibre. It is placed in any suitable recess of a tree stump, or at the base of a palm leaf from which the leaves have fallen. Eggs number 2 to 4, the ground colour of which is cream. They are blotched with reddish-brown to deep purple brown.

(*To be continued*)

A NOTE ON THE POSITION OF RHINOCEROS IN BURMA

BY

W. F. H. ANSELL

(*With a map and a plate*)

INTRODUCTION

Before the War in Burma several articles were written on rhinoceros in Burma, and the measures for safeguarding its continuation of existence in that country.

The present writer can claim no special knowledge of rhinoceros, but immediately after the cessation of hostilities in Burma was in the position of having to make fairly extensive tours on army duties in many parts of the country. During this time I was able to pick up certain information regarding the present position of the species and thought it might be worth while to record this. Having commenced to make some notes I felt that they would be of little interest to anybody without some background and decided to try and make a summary of records of rhinoceros in recent years so that the present position could be compared with that of pre-war.

My notes are recent (1947) and though I have not been able to visit certain areas I intended to, it is this claim to being post-war and up-to-date that is my excuse for writing them.

Once again raising the question of the protection of rhinoceros in Burma surely needs no justification.

I would like to express gratitude to those members of the Forest Department who have helped my compilation of records by lending me the Game Reports of Burma and in other ways, and to the Bombay Natural History Society who have helped me in every way, and especially by giving me access to their extensive library during my stay in Bombay.

Rough outline of the Family Rhinocerotidae with especial reference to Burmese forms.

The family *Rhinocerotidae* of the order *Perissodactyla* (odd-toed ungulate mammals) formerly possessed a wide range, with several genera in North America, Europe, Asia and Africa, including the U.K. One of the better known of the extinct forms was the so-called Woolly Rhinoceros (*Coelodonta antiquitatis*) which existed in North Europe and Siberia. Present day forms are confined to South East Asia (including Assam, Bengal and Nepal) and Ethiopian Africa.

The African rhinoceroses, which do not concern the present subject are *Diceros bicornis* (Linnaeus) and *Ceratotherium simum* (Burchell), both being two-horned.

The Asiatic forms are as follows:—

Genus *Rhinoceros*, Linnaeus, Syst. Nat. ed. 10, vol. i, p. 56, 1758.

One horned; skin divided into heavy folds; few hairs except on ears and tail.

1. *Rhinoceros unicornis* Linnaeus op. cit.

The Great Indian One-horned Rhinoceros. Vernacular: Gainda (Hind.).

Skin tuberculated, or 'studded'. Folds of skin heavier; folds running over shoulders not meeting on neck; size larger. Confined to Assam, Bengal and Nepal and does not concern the present area.

2. *Rhinoceros sondaicus* Desmarest, Mammalogie, vol. ii, p. 399, 1822.

The Javan, or Lesser One-horned Rhinoceros. Vernacular: Gainda (Hind.), Kyan or Kyanesin (Burmese), Badak (Malay), Ta-do or Ta-do-khaw (Karen).

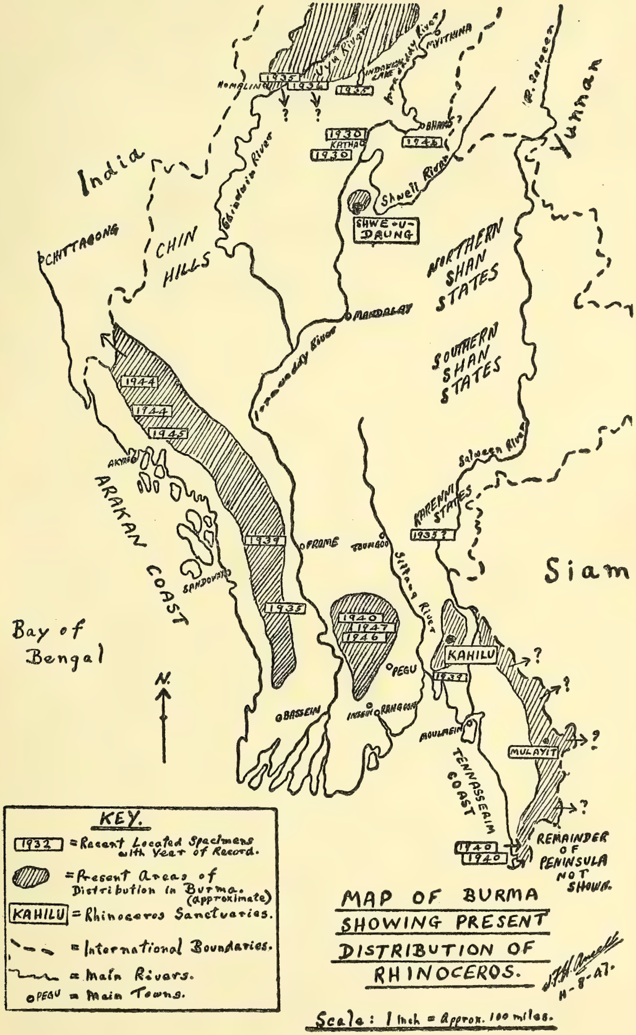
Skin not tubercular. Throat folds less heavy; shoulder folds joining on neck to form anterior nape fold; size smaller. Horn in females small or absent.

Range: (i.e. former range) Assam (?) the Sunderbans and certain other parts of Bengal; the Sikkim Terai, Burma, Malaya, Sumatra (?) Java, Borneo, Siam. Indo-China? 'Western Provinces of China' Sterndale, p. 410 (from MS by Cockburn).

'Kinloch shot an undoubted specimen in the Sikkim Terai'—Blanford. Mr. G. Busk ascribed a tooth from Sarawak (Borneo) to *R. sondaicus* and considered that two teeth obtained by Mr. Wallace in Sumatra were of the same species (*P.Z.S.* 1869, p. 409).

'The Sunderbans and formerly the Rajmahal hills in Bengal; Assam, south of the Brahmaputra . . .' (Cat. Mamm. Ind. Mus. Calcutta, Pt. II, p. 203, 1891.)

The Cat. of Ind. Museum includes a list of specimens from Sunderbunds, Jessore Dist. (Bengal), Tennasserim, Tavoy Point and Java.


India
Yunnan
Siam
Bay of Bengal
CHITTAGONG
CHIN HILLS
HOMALIN
Uyu River
INDAWGYI LAKE
Irrawaddy River
MYITKINA
R. Salween
BHAMO
KATHA
Chindwin River
Shwell River
SHWE-U-DAUNG
NORTHERN SHAN STATES
SOUTHERN SHAN STATES
MANDALAY
Irrawaddy River
Salween River
KARENNI STATES
AKYAB
ARAKAN COAST
SANDOWAY
PROME
TOUNGOO
Sittang River
PEGU
BASSEIN
INSEIN
RANGOON
KAHILU
MOULMEIN
MULAYIT
TENNASSERIM COAST
REMAINDER OF PENINSULA NOT SHOWN.
1935
1936
1935
1930
1930
1946
1944
1944
1945
1939
1935
1940
1947
1946
1935?
1939
1940
1940
N.
KEY.
1932 = Recent Located Specimens with Year of Record.
▨ = Present Areas of Distribution in Burma. (approximate)
KAHILU = Rhinoceros Sanctuaries.
= International Boundaries.
= Main Rivers.
○PEGU = Main Towns.
MAP OF BURMA SHOWING PRESENT DISTRIBUTION OF RHINOCEROS.
J.H. Ansell
11-8-47.
Scale: 1 inch = Approx. 100 miles.

Mr. Ansell's article on Rhinoceros.

Jerdon (*Mammals of India* 1874, p. 234) recorded a few *R. sondaicus* in the forest along the Mahanaddy River and the Rajmahal Hills near the Ganges and 'more abundantly in Burma and . . . Borneo.' He records that several had been shot 'recently' within a few miles of Calcutta.

C. H. Stockley in *Big Game Shooting in the Indian Empire* 1928, records the Sikkim Terai among other places.

HABITAT: *R. sondaicus* frequents forests, and Blanford records that it has been observed at considerable elevations. But in the Sunderbans it frequents swampy ground and E. H. Peacock records a fondness for low lying swampy ground.

Sterndale (1884) records one at an altitude of 4,000 feet and describes it as 'more of a forester' than *R. unicornis*.

It would seem from the above that the species can make itself at home either in low lying swamp or hill forest (though not as dense or as hilly forests as *D. sumatrensis*).

DIMENSIONS: Cockburn recorded of a female as follows. Length of body (head and body?) 12 ft. 3 ins.; tail 2 ft. 4½ ins.; height 5 ft. 6 ins. 'The height of a mature specimen is probably about 5 ft. 6 ins.' (Peacock).

HORN: 'Said to be about 10 ins. in length' (Peacock).

Length on front curve of horn 10¾ ins. has been recorded from Java.

SENSES, HABITS AND FOOD: Similar to *D. sumatrensis* according to E. H. Peacock, and 'presumably of a less active and alert disposition'.

BREEDING: Presumably similar to others of the family, but little or nothing has been recorded about its breeding habits.

Genus *Dicerorhinus* Gloger, Handbuch Naturgesch, p. 125, 1841.

Two horned; skin folded; more or less hairy all over. Ears well fringed with hair. The body hairs take the form of bristles.

1. *Dicerorhinus sumatrensis* (Cuvier) Regne Animal., vol. i, p. 240, 1817 (as *R. sumatrensis*).

The Sumatran or Hairy Rhinoceros. Vernacular: Kyan or Wet Kyan, (Burmese) Ta-do or Ta-do-khaw (Karen) Lawon (Shan) Badak (Malay).

Characters as under the genus. The smallest living representative of the family.

Type locality: Sumatra.

Local races of the species in Burma have been named as follows:—

Dicerorhinus sumatrensis blythi (Gray). Type locality: Tenasserim.

Dicerorhinus sumatrensis lasiotis (Sclater). Type locality; Chittagong.

RANGE: Assam, Tipperah, Arakan, Burma, Siam, Fr. Indo-China, Malaya, Sumatra, Borneo (not Java). Extinct or very rare in most parts.

'Rare in Assam' (Blanford).

A specimen shot in Brahmaputra valley is recorded in *P.Z.S.* 1875, p. 566.

I can find no mention of the species in the Sunderbans of Bengal.

HABITAT: Mainly if not exclusively dense hill forests.

The species wherever it is found needs mud wallows, and these are often in the pockets of hills near the sources of streams, according to Peacock.

'Seems to stick to hills' (Stockley).

DIMENSIONS: The smallest form of living rhinoceros. 'The type of *lasiotis* was 4 ft. 4 ins. high and 8 ft. long from snout to root of tail; its weight about 2,000 lbs. (Anderson).'

'An old female from Malacca was only 3 ft. 8 ins. high' (Blanford) . . . 'Average height is about 4 ft. 3 ins. and average length about 10 ft. including the tail. This was the average of three' . . . (Peacock). Peacock's largest specimen was 4 ft. 8 ins. in height.

HORN MEASUREMENTS: There is a specimen with front horn 32 1/8 ins. in the British Museum.

Peacock gives 7-8 ins. average for front horn of ♂♂ and 3 ins. for posterior horn; and 3 ins. for anterior horn of ♀♀ and 'mere knobs' for the posterior horns, in Burmese rhinoceroses.

SENSES: Smell and hearing are said to be very good, but as throughout the family the sight is poor.

HABITS AND FOOD: *D. sumatrensis* is a prehensile-lipped browser, feeding off leaves, twigs and other suitable plants including small bamboo.

It is a shy and retiring animal and addicted to wandering, often for great distances, from its normal beat. As remarked above it has a particular liking for mud wallows (which seem essential for its well-being) and which will invariably be found where the species exists. The day is spent lying up or in a wallow, feeding usually taking place in the early morning and evening.

Like others of the family it uses the same place when possible for excretion, the pile of dung often becoming considerably large, according to some authorities.

BREEDING: One calf at a time is usual, but little is on record about its breeding habits.

'The period of gestation is said to be eight months' (Peacock).

Bartlett considered the period of gestation to be probably a little over 7 months (*P.Z.S.* 1873, p. 104).

2. POSITION OF RHINOCEROS IN BURMA IN THE PAST, AND A FEW LEGENDS REGARDING RHINOCEROS.

The rhinoceros, being so large and striking a creature, it would be surprising if several legends concerning it did not arise, and unfortunately some of the legends about it have proved the undoing of the Asiatic species to an alarming extent.

A widespread belief throughout the East in the aphrodisiac properties of rhinoceros horn, especially among the Chinese has been the primary cause of the great diminution in numbers of all the species in Asia, and the rarity of rhinoceros resulting from this makes the horn all the more valuable. Thus, the demand being ever unsatisfied, the value would, and in fact, does, rise in something like direct proportion to the decrease in the numbers of rhinoceros.

It is said that in the old days caravans used to come from China, right across Tibet to India in search of the horn, resulting in the extermination of *R. unicornis* throughout a large part of its range, till today it survives only in parts of Nepal, Bengal and Assam.

The Hindus are said among others to cherish a belief in the potency of rhinoceros horn as an aphrodisiac.

The Burmese rhinoceroses too suffered from this quest for horn, and within recent years it has resulted in, for all practical purposes, the extinction in Burma of *Rhinoceros sondaicus*, and reduction to a danger point of *Dicerorhinus sumatrensis*.

It was, of course, the advent of the firearm which produced this alarming decrease in numbers, as before the days of guns and rifles the rhinoceros had apparently weathered the storm of centuries of pursuit reasonably well.

Relying on pitfalls and other primitive means, the securing of a rhinoceros, even where plentiful would doubtless be a feat requiring unlimited patience and skill, and some courage, for the rhinoceros of all species are well known as no mean adversaries when aroused.

However, with firearms in the hands of an experienced hunter the killing of a rhinoceros would present no great difficulty granting that sufficient time were available to locate it.

E. H. Peacock states that before the advent of firearms the Sumatran rhinoceros must have been fairly common in Burma, and that also there must have been a fair number of *sondaicus* in the parts of lower Burma frequented by the species. Certainly there is no lack of suitable country for both forms in Burma, with its vast forests and hills (though encroachment of cultivation in some of the lower lying haunts of *R. sondaicus* would probably tend to localize the species to some extent).

It may be said that, generally speaking, one of the more usual (and often decisive) factors in the extermination, or extreme reduction and localization of any species was absent or nearly so in the case of the rhinoceros in Burma. I refer, of course, to the advancement of civilisation, usually in the form of cultivation into the habitat of species. It is difficult to conceive of any serious conflict of interests in the claims of the rhinoceros and cultivators in Burma; and the rhinoceros on the whole is considered a fairly harmless beast. More especially is this apparent in the fact that such a large proportion of Burma's wealth lies in timber, and consequently the upkeep and maintenance of the forests is an important factor in the country's economy.

The Karens of Burma, and probably other races too, believe in the efficacy of rhinoceros blood and other parts in curing many ailments which gives added incentive to the poacher. In fact there is no part of the rhinoceros (including the urine) which would not be saleable at a high price.

To illustrate the extremely active demand for rhinoceros parts I can quote the fact that during the British retreat from Burma in 1942, the rhinoceros in the Rangoon Zoological Gardens was killed and stolen; I believe almost before the City was evacuated completely. A mounted head which came into my possession in 1946 had been on the wall of a large stores in Rangoon for many years, but during the Japanese occupation the anterior horn was completely removed.

There is a legend in Burma which I have heard quoted in widely separated parts of the country that one of the reasons for the slow rate of increase in rhinoceros is due to the female tossing logs off the track over her back, killing the young. Alternatively this story is rendered as the calf itself being thus thrown into the air. What foundation, if any, exists for this legend I am unable to say.

Several authors in their writings about rhinoceros have quoted the belief in a 'fire-eating' or 'fire attacking' rhinoceros. I have met no reference to this in Burma from locals whom I have come across.

This year I came across a Karen belief that I had never previously heard. It is that it is considered a bad omen to kill a rhinoceros, as doing so will result either in the death of some member of one's family or in crop failure, or similar retribution.

However, I am sure that no such consideration would put the Karens off killing a rhinoceros if the opportunity offered, and indeed if the truth be known I should imagine that Karen hunters had taken a large part in the sad reduction of rhinoceros in Burma especially *R. sondaicus*.

Summing up, it may be said that on the whole rhinoceros in Burma before the coming of the firearm were in a reasonably good position in so far as a very extensive habitat for them existed all over the country, and that indiscriminate poaching with firearms has been in the main responsible for their great reduction.

3. Legislation regarding Rhinoceros in Burma.

At the outset of this paragraph I will say that legislation for the Protection of Wild Life in Burma today may be considered as almost a complete farce, and existing for all practical purposes only on paper with no machinery for enforcing the laws.

Regarding rhinoceros there are appalling loopholes in the law itself.

First the penalties for destruction of rhinoceros have too low a maximum, and the probability is that even in the unlikely event of a conviction for an offence regarding rhinoceros the full penalty, such as it is, would not be imposed.

Minimum penalties should include at least a term of imprisonment without option of a fine, plus such a fine as would be appropriate.

I am convinced that to kill a rhinoceros in Burma today would repay one's efforts handsomely even should the maximum penalty be incurred.

The next defect in the law is even worse, as it makes it legal for persons other than museums or similar accredited institutions to possess parts of rhinoceros for 'medicinal' purposes. How this came about is shown below, being the gist of Chapter V of the Burma Game Warden's Report for 1934.

In 1933 the then Prince of Wales instituted an enquiry into the adequacy of protection for rhinoceros in the Indian Empire (which at that time included Burma). The result of this was that a Select Committee was appointed to look into the matter, and the penalty for killing a rhinoceros illicitly was increased. This was all to the good, but a farther amendment was made

The Wild Birds and Animals Protection Act previously restricted the legal killing of rhinoceros to persons in possession of a Special Governor's Licence which would be issued only in the interests of scientific research, and as it stood was quite reasonable and adequate.

But the Select Committee, in spite of earnest pleas by the then Game Warden, decided to pander to fictitious beliefs and superstitions and considered it desirable to provide for cases where the killing of rhinoceros for 'medicinal' purposes might be justified.

The Committee considered the words 'in the interests of scientific research' were 'too binding' (as if they were not meant to be 'binding') and accordingly this clause was deleted from the provisions governing the issue of licences under Rule 18 of the Act.

And this in spite of the Game Warden pointing out that *R. sondaicus* was the rarest large mammal in the world!

It is difficult to conceive how any responsible body could have taken such a retrogressive and unenlightened step. One assumes that the Committee was composed of educated persons and as such one would have expected belief in superstition to have been supplanted by some faith in modern medicine.

Even assuming that the Committee as a whole held belief in the medicinal properties of rhinoceros parts, one would expect them to have realised that in any case the supply of such parts available would be totally inadequate and soon become exhausted, Burma losing for ever in the process one of its grandest and most interesting species.

This was another blot on the copy book of wild life protection in Burma, which seems, (if I may continue the metaphor) more blots than clean sheet.

In fairness, however, I must say that up to and including the last published Game Report there was no record of a Special Licence for rhinoceros having been issued for 'medicinal' purposes and there is no reason to suppose that any such licence has been issued since up to date (July '47).

This, however, gives little cause for complacency as (except during the Japanese occupation) the Governor under whose hand such licence would have to be given, and the senior forest officers through whom any request for such would have to go, have up to now been Europeans, while now the administration is becoming more and more Burmese, and in the very near future likely to be completely so. In this connection it should be remembered that it was undoubtedly the Oriental section of the Select Committee who were responsible for the amendment referred to above.

Regarding rhinoceros sanctuaries, or sanctuaries constituted mainly for the protection of rhinoceros, there are three nominal ones in Burma at present. These are dealt with in the following paragraph.

In *J.B.N.H.S.* Vol. xxxix, No. 3, p. 606 (1938) is a note on the Burma Wild Life Protection Act. It gives a good account of the revision of the Act of 1936 under which it became legal for any physician, druggist or private person to possess rhinoceros blood or any preparation thereof for 'medicinal' use. This seems to be a further amendment to the deletion of the clause 'in the interests of scientific research', and is of course another retrogade step.

To sum up, it would seem that the following conditions apply to rhinoceros in Burma today (though my information may possibly not be complete).

Rhinoceros of both sexes are completely protected throughout the year and may not be hunted except under a Special Licence. But it is not illegal for any person to possess rhinoceros blood for 'medicinal' purposes.

4. RECENT AND PRESENT RANGE AND DISTRIBUTION OF RHINOCEROS IN BURMA.

[From 1929 to the present (1947)]

As referred to above the rhinoceros must have had a considerable range all over Burma until its great reduction in numbers, and even today the range of *D. sumatrensis* is very extensive, though everywhere the animal is rare and has become extremely localised.

In this paragraph will be given at the start a brief outline of the sanctuaries constituted mainly for the protection of rhinoceros, as these are so often referred to in the information derived from the Game Reports. Subsequently other known and probable locations of rhinoceros will be mentioned with any relative evidence I have been able to collect.

(*a*) The Shwe-U-Daung Sanctuary lies in East Katha and Mongmit State and is 81 square miles in extent. It is in high mountainous country with plenty of dense cover favoured by *Dicerorhinus sumatrensis*, the form inhabiting the Sanctuary. Rhinoceros are found mostly on the Mongmit side of the border.

The species has probably always existed in the area, but it is exceedingly difficult to give any accurate estimate of numbers. What is certain is that there are at least five regularly used wallows. Young have occasionally been reported in the Sanctuary.

It is quite possible to visit the Sanctuary and see three or even more specimens, and equally possible to see none at all, though invariably signs of them will be found. A legend that the mountain spirits of Shwe-U-Daung do not like poaching is probably one of the most effective factors in the success of this Sanctuary to date.

The rhinoceros occasionally wander outside the Sanctuary limits.

(*b*) The Kahilu Sanctuary in the Salween and Thaton districts was originally constituted for the protection of *Rhinoceros sondaicus* but investigations in 1938/39 cast doubt upon their existence (vide para 5 below). A specimen in 1939/40 was identified as *D. sumatrensis*. The Sanctuary is 62 square miles in extent. Previously two Rangers were employed to look after this sanctuary.

(*c*) The Mulayit Sanctuary in the Mergui Division was originally thought to contain rhinoceros but, as far as I can trace, their presence there was never either proved or disproved. The probability is that specimens may wander there from time to time.

(*d*) The Pidaung Sanctuary, near Myitkyina, 260 square miles in extent is not specially a rhinoceros preserve, but Mr. Mustill formerly Game Warden, Burma, noted on one of my maps that rhinoceros migrate there at times from the Uyu river drainage.

Following is some information derived from the Game Warden's Reports of Burma when they were published annually from 1929 to 1940, and the extracts refer to the year previous to publication.

1929-30. The Game Warden saw a rhinoceros in the Shwe-U-Daung Sanctuary at 5,000 ft., but it was reported they are not plentiful there. The Kahilu was reported to contain at least three rhinoceros. Tracks of an adult were seen. The keepers saw two, and tracks of two other, of which one set was believed to have been of the calf born in 1928.

Tracks of a rhinoceros believed to be *R. sondaicus* were seen on the Dawna Range at 6,822 feet. It was reported that there were at least two gangs of rhinoceros and elephant poachers in the Arakan Yomas.

1931. In the Shwe-U-Daung a ♂ *D. sumatrensis* was shot under orders by the Game Warden, on the Mongmit side. The skin and skull were sent to the British Museum.

Three rhinoceros were seen and it is estimated that there are eight to ten altogether there. The legend of the *Nats* (spirits) on Shwe-U-Daung is mentioned as a probable cause of the immunity of rhinoceros from poachers in the Sanctuary.

In the Kahilu Sanctuary a skeleton, believed to be that of *R. sondaicus,* was found. It is estimated that there are four specimens in the area.

During the year a rhinoceros crossed the Uyu drainage and came within 5 miles of the railway line in Katha division. Unfortunately a Kachin shot it.

1932. Four specimens were estimated in the Kahilu Sanctuary. The young one born in 1928 was reported to be 2½ ft. in height.

Another rhinoceros came over the Uyu area into the Nami and Ledan valleys during the cold weather and was seen as far south as the Indaw-Banmauk road. Later it was reported making for the Meza Chaung.

1933. In the Shwe-U-Daung tracks were seen, but no evidence of any increase reported. The number is estimated at not more than twelve, the majority being in the dense jungle on the Mongmit side, and in the Ye-nya-u drainage.

Mr. Allsop reported that at least six specimens were in the Kahilu.

The coast in Mergui district is mentioned as a former haunt of rhinoceros.

Illicit hunting of rhinoceros was reported on the Arakan Yomas and two accused fined Rs. 50 each for being in possession of rhino blood and four hooves.

(Note the ridiculous inadequacy of the punishment!)

1934. Fresh tracks were seen in the Shwe-U-Daung.

The Kahilu estimate was still six specimens.

They were reported to be fond of eating chillie crops and doing a little damage in the *taungyas* (fields, usually among the hills, cut out of the jungle, and usually abandoned after one season). In July (1933) a forester reported he had seen two rhinoceros mating.

1935. One specimen was seen in the Shwe-U-Daung but no tracks were seen on the Burma side. The rhinoceros in Kahilu were estimated by the head keeper at the figure of eight, but this was not verified.

Two rhinoceros were rumoured in the Nam Pawn drainage in Karenni.

1936. It was reported again that the Shwe-U-Daung rhinoceros prefer the dense jungle on the Shan States (Mongmit) side of the Sanctuary, and that there were several wallows there. The estimate of numbers was eight.

The keeper's report of eight rhinoceros in Kahilu was not confirmed and the official estimate remained at six. They were reported to leave the Sanctuary at times and feed outside during the dry season.

A rhinoceros was seen on the left bank of the Uyu river in West Katha division, and two were reported from the East bank of the Chindwin river, above Homalin. It was suggested by reports that there were several rhinoceros in West Katha, in the Namaw R. F. and the Uyu drainage.

In Henzada division a rhinoceros was seen in the Chaukni stream, west of Kyangin.

In Myitkyina area a rhinoceros was shot in the Nanyin Kha reserve. Two accused were given two months R.I. plus Rs. 100 fine, or a further month's R.I. in default of payment.

(*Note.*—It is gratifying to see that prompt action was taken in this case, and that a prison sentence was awarded.)

1937. Doubt was expressed as to the presence in Shwe-U-Daung of more than ten specimens.

There were five wallows on the Mongmit side, but no young ones were reported. In Kahilu the six specimens were accounted for.

Rhinoceros were reported in the Mulayit Sanctuary in the Mergui area.

A note on the Shwe-U-Daung puts the estimate as given by the locals at between 10 and 200! Obviously the first figure would be much nearer the mark, and even optimistic.

1938. In Shwe-U-Daung the five wallows were seen and the estimate of numbers was given as about five and probably more, but no calves. Tracks found on hard ground measured 7 inches in diameter.

In Kahilu a calf was said to have been born in the year ending March 1938. The total number in the Sanctuary was given as seven, consisting of two bulls, four cows and one bull calf.

The Kahilu rhinoceros were reported to occasionally leave the Sanctuary and visit salt licks outside.

Suggestions for the improvement of the Shwe-U-Daung Sanctuary were given.

A rhinoceros was reported in the lower Uyu valley in 1937.

There were reported rumours of a so-called 'Pygmy rhinoceros' in the Salween area. (See para 7 below.)

(Note on the breeding of rhinoceros in Kahilu. If the report of two rhinoceros mating in 1933 were correct it is possible that another calf may have been born between then and 1938. The last previous record of a birth in the area was in 1928.)

1939. The Shwe-U-Daung estimate is given as between twelve and fifteen. Tracks were seen believed to have been of a cow and a calf, and many other tracks found. On the Mongmit side tracks of at least three were seen. Tracks of one were observed on the Burma side, outside the Sanctuary. Three rhinoceros were reported as living in the areas of the wallows. From the tracks and dung seen it was stated that there was no indication of any decrease in the rhinoceros in the Sanctuary.

Doubt was expressed as to whether the rhinoceros in Kahilu were *D. sumatrensis* or *R. sondaicus* (see para 5 below.)

Tracks of a rhinoceros were found in Thanichaung Reserve in Thayetmyo division.

1940. In the Shwe-U-Daung no casualties were reported, and a young one was seen. It was considered that the herd in this area was well established. An estimate of fifteen specimens was given, including seven young (but it was mentioned that this must be taken with reserve).

In Kahilu one specimen was definitely identified as *D. sumatrensis* and it was stated that it was considered that *Rhinoceros sondaicus* did not exist in that area any longer. However, it is mentioned that a rhinoceros with a calf was seen by Karens in the year 1939-40 at the foot of the Kyaikto hill, on the border of Thaton and Pegu districts. The Karens' description is said to have closely corresponded with that of *R. sondaicus*, and steps were taken to follow this up, with what result is not mentioned.

There is a note in the 1940 report that tracks of *R. sondaicus* may measure up to 11 inches in diameter while those of *D. sumatrensis* rarely exceed 8 inches.

In the Amherst district tracks of rhinoceros were reported in the Man-aung and Yechaung Reserves, and tracks of another in the Tavoy Division. Tracks were also reported in the Henzada-Bassain Division (exact place not stated). Another track was seen on Sanwingan Hill in Tharrawaddy.

The range of *Dicerorhinus sumatrensis* is stated to include Tenasserim, Pegu Yomas, Arakan Yomas, Lower Salween and the Uyu drainage.

Such are the various records of rhinoceros in Burma from the official Game Warden's Reports up to their cessation in 1940.

Mr. C. McCann of the B.N.H.S. informs me that he observed the tracks of a rhinoceros in 1935 in the area between Tawmaw and Kora, north of the Uyu river, and Peacock mentions parts of Myitkyina area as locations (or former locations) of *Dicerorhinus sumatrensis*.

Little is on record during the War years except the following:—

In the *Journal B.N.H.S.* for December 1945 there is a letter from Lieut.-Gen. Sir Philip Christison on the present distribution of *Dicerorhinus sumatrensis* in the Arakan, with a map. This note recorded the distribution in five different areas, based on actual specimens seen, and tracks, droppings and wallows pointed out by the locals.

The areas marked by Gen. Christison on his map are:

(*a*) About 15 miles N.E. of Paletwa;

(*b*) About 25 miles east of Paletwa and c. 40 miles N.N.E. of Myobaung;

(*c*) About 22 miles N.E. of Myobaung.

(A specimen was seen in each of the above areas.)

(*d*) About 50 miles S.S.E. of Myobaung and c. 40 miles N.E. of Myebon;

(*e*) In a line with Sandoway and Prome and about half way between.

The three specimens actually observed were recorded by three different officers and all said the rhinoceros they saw had one horn, but Gen. Christison did not accept this as indicating *R. sondaicus* because of the ease of mistaking a specimen with only a small posterior horn as one horned, and because the places where the rhinoceros were seen was so typical of the haunts of the Sumatran form.

General Christison states that on two occasions tracks of a cow with calf were observed, and his note is exceedingly interesting, especially as it is so recent and so carefully recorded. Fortunately I am able to supplement Christison's information to a small extent regarding rhinoceros in the Arakan Yomas.

In August 1946 when at Prome I met a Forest Ranger of Thayetmo who stated that there are mud wallows used by rhinoceros in the Thaledan R. F. which is between Sandoway and Prome in one of the areas indicated on Gen. Christison's map. This ranger also said that the forests of Mindon are reputed to contain a few rhinoceros, and in his own opinion there were not more than four or five on the whole eastern side of the Range, and they are not resident but migratory. In 1940 this ranger got a report of blood and bones of a rhinoceros in the possession of someone in the Arakan Yomas.

Southwards rhinoceros used to be found right along the Yomas for some distance almost to the southern coast but whether there are any now I am unable to say.

Mr. Castens states that when he was in Arakan some years ago there were a fair number of 2-horned rhinoceros about. In other parts of Burma I have been able to collect the following recent indications of rhinoceros.

A semi-official statement obtained by me at Myitkyina indicates that a rhinoceros was killed in early 1946 in the Bhamo district in so-called 'defence of crops'. Unfortunately, with the state of the country at that time little was done to follow up the matter, though apparently the excuse for destroying the rhinoceros was accepted.

Regarding the Shwe-U-Daung rhinoceros, there is no evidence that they suffered during the Japanese occupation. One of the Mongmit State officials informed me that there were about eight rhinoceros there, and the fact that there are undoubtedly rhinoceros in the sanctuary seems to be well known in the State. Mr. Lindsay-Smith, D.F.O., East Katha, says that the number is reported to be fifteen, so it seems that the general estimate is about the same as before the war.

The Kachins near Hopin told me of the supposed existence of rhinoceros west of Indawgyi Lake; and this would seem to indicate the Namaw Reserve area.

An official of Bawlake State (Karenni) informed me that there were about six rhinoceros in the Salween area. He said 'south of Mawchi' and might have meant the Yunzalin watershed, but more probably he meant the Kahilu area itself.

A D.O. letter from the D.F.O. Thaton (Aug. 1946), in answer to an enquiry, informs me that there is at least 'one family' of rhinoceros in the Kahilu Sanctuary and that tracks of two were recently seen.

Mr. F. Allsop, P.F.O. Shan States informs me (in litt.) that no rhinoceros are known to exist in the Southern Shan States or Karenni, and that he has never heard of them in these areas, in which he has travelled extensively. However, in addition to the rhinoceros reported in the Nam Pawn drainage in 1935 (see above) I have received information, (that I consider fairly reliable), of a ♀ rhinoceros killed somewhere about 1935 near M.S. 70 Mawchi Road, South of Kwachi village.

I had hoped that I might have obtained some records of rhinoceros in and north of Kantharawaddy State towards the Salween, and the Indo-China and Siam border but failed to do so. This area would seem to me to be eminently suitable for rhinoceros and I was disappointed not to come across any records. In the face of this information I think it can be assumed without much fear of contradiction that no rhinoceros now exists in Karenni.

Regarding Pegu Yomas, there are still a few rhinoceros in the dense jungles round about the central portions of the range. Last year (1946), about March I received information that the tracks of a cow and calf had been seen in the Yomas, exact locality not stated but probably North-West of Pegu. If this is correct, the existence of a calf implies a third specimen—the bull; and I consider this information reliable, it being supplied by a European representative of one of the timber firms from his personal observation.

Further evidence of rhinoceros was obtained by me this year. Having an interest in the elephant catching operations in the South Pegu area in the 1946-47 season I instructed the Karens working on the stockade to report any signs of rhinoceros, and in March a track of a rhinoceros was seen in the Shwelaung reserve between Shwelaung and the Pegu river, about four miles from Kadokchaung. The observer called one of the workmen to look at them and he confirmed that the track was of a rhinoceros. I consider this evidence reliable. The track was said to be fairly large, about the size of that of a 5-foot elephant, which would be about 2′ 6″ circumference.

Before giving a summary of the present known, and possible locations of rhinoceros in Burma, I must draw attention to certain articles that appeared in the *J.B.N.H.S.* regarding the position of both species in Burma prior to the War.

These articles are a memorandum on the Kahilu Sanctuary by Mr. D'Arcy Weatherbe, written after a visit to the Sanctuary, (*J.B.N.H.S.*, Vol. XLI, No. 1, p. 146). This note, by an acknowledged authority, goes very thoroughly into the status of the Sanctuary, and into the question of the species of rhinoceros in the area, and casts doubt on the many references regarding the number and species of rhinoceros that were acquired from the Game Rangers.

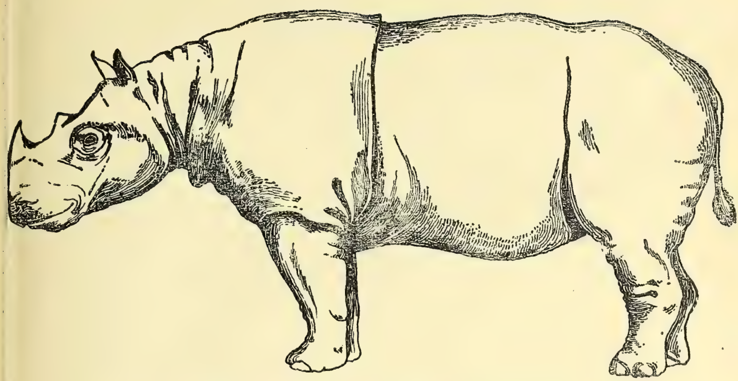
A good review by the late Theodore Hubback of the Annual Report on Game Preservation in Burma for the year ended March 1938 is contained in the same issue of the *Journal.* Another article entitled 'Burma's decreasing Wild Life' is found in *J.B.N.H.S.*, Vol. XLII, p. 150, also by Mr. D'Arcy Weatherbe (Dec. 1940).

These articles I strongly recommend to anyone who has the future of Burma's wild life at heart. There is much hard hitting in the way of criticism of the measures taken pre-war to safeguard the Burmese fauna—all of it supported by facts, and all of it seems abundantly justified.

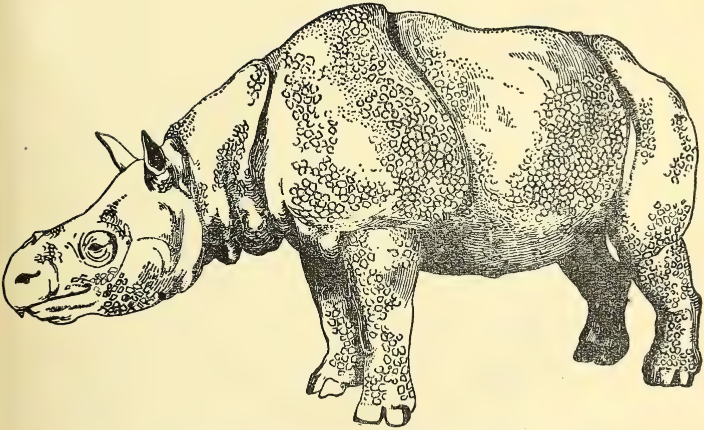
Much of the information I have quoted above from the Game Warden's Reports is subjected to fair criticism and analysed. (I have merely set this information down as the gist of the official record only, and advise anyone interested to read the extracts in conjunction with Mr. Weatherbe's notes.)

Following is a summary, mainly based on the information recorded above of the present known locations of rhinoceros in Burma and of the other areas where they possibly or probably exist.

(*a*) *The Shwe-U-Daung Sanctuary.*—There are certainly a few specimens of *Dicerorhinus sumatrensis* in the sanctuary at present and no positive evidence of any undue decrease in numbers since pre-war. The estimates I have been able to gather are from eight



The Sumatran Two-horned Rhinoceros [*Dicerorhinus sumatrensis* (Cuv.)]
(Height at shoulder about 52 in.)



The Smaller One-horned Rhinoceros (*Rhinoceros sondaicus* Cuv.)
(Height at shoulder 70 in.)

to fifteen though both these figures are probably arbitrary and should not be taken as in any way accurate.

(*b*) *Arakan Yomas.*—A few rhinoceros exist in the Arakan ranges, from the Paletwa Area in the north to at least as far south as below the Sandoway-Prome road. The rhinoceros of this area undoubtedly spread at times to the eastern side of the range in the forests of Mindon and Thayetmyo, and probably into Henzada Division as well, in addition to the Arakan side proper. From General Christison's report I am inclined to think there are more specimens here than commonly supposed, and certainly there is more positive (recent) evidence than for any other area.

(*c*) *Pegu Yomas.*—It is known that a few specimens are at present in the Pegu Yomas and these would probably range in the Pegu, Tharrawaddy, and Insein Divisions, possibly Prome, and may at odd times go as far north as the southern part of Toungoo district.

(*d*) *The Uyu River Drainage area.*—Though I have no actual positive records of rhinoceros being seen here since the end of the war the area is very remote and (comparatively) sparsely populated and was not disturbed in any major way by the progress of the war. It is an area in which a few rhinoceros have always been supposed to exist and there is no reason to suppose they were entirely wiped out during War years. Rather to the east of the Uyu itself and west of Indawgyi Lake is the Namaw Reserved Forest and the Kachins in the 'Railway corridor' at Hopin reported that a few rhinoceros could be found occasionally in the area. Farther to the east this vast tract of wild country joins the Pidaung Reserve (unfortunately I believe severely 'shot out' during the war) and Mr. Mustill, formerly Game Warden, informed me by a diagram on one of my maps of a migration of rhinoceros at times from the Uyu area to Pidaung. From the Game Reports there have been many positive records of rhinoceros from the Uyu in recent years and it can be considered as almost certain that a few specimens exist there today.

(*e*) *Kahilu Sanctuary and the Yunzalin River area.*—Tracks were seen of two rhinoceros in the Kahilu last year and from the other reports I have obtained it seems that there are a few in the area today. I imagine these would be isolated from the southern part of Tenasserim, and from Siam by the Salween river. These rhinoceros would range in the Salween and Thaton areas, possibly touching on Pegu Division.

(*f*) *Tennasserim Peninsula.*—I have no post-war record of rhinoceros in this area but from past accounts it seems likely that there may be an odd, (and probably isolated), specimen or two anywhere in the dense jungle covered mountains of the Dawna Range and all down the peninsula in the Mergui and Tavoy Divisions, these rhinoceros undoubtedly at times crossing the Siamese border.

(*g*) *Bhamo area.*—The rhinoceros reported shot in the Bhamo area was possibly a wanderer from the Shwe-U-Daung in which case it would have crossed the Shweli river. It is just possible that one or two may exist in the hill tracts in the Bhamo area, but probably their numbers would be negligible.

These I consider are the only areas where rhinoceros might be found in Burma today.

Anyone acquainted with the country can see what vast areas there are which are ideal habitat for the animal, in which they have long since disappeared, such as for instance the Chin Hills and Karenni States.

I give below, for what it is worth, an estimate of numbers of rhinoceros at present in Burma.

LOWEST REASONABLE ESTIMATE.

Shwe-U-Daung	5—Known established haunt of *D. sumatrensis*. Estimates over many years have been between five and fifteen.
Arakan	7—Three seen (1944-45), tracks of cows with calf noted twice.
Pegu Yomas	3—Tracks of three seen 1946-47.
Kahilu area	2—Tracks seen in 1946.
Uyu drainage area	4—An arbitrary estimate based on frequent records of specimens from this area for some years and the fact that there seems to have been no undue disturbance during the war.
Total	21

POSSIBLE REASONABLE ESTIMATE.

Shwe-U-Daung	10
Arakan	12
Pegu Yomas	5
Kahilu and Yuzalin	6
Uyu drainage	8
Tennasserim peninsula	4
Total	45

I conclude that there are not less than 21 rhinoceros in Burma today and possibly as many as 45 though the latter figure may be considered too optimistic by some.

5. THE QUESTION OF THE EXISTENCE OF *Rhinoceros sondaicus* AT PRESENT IN BURMA.

The Kahilu Sanctuary was constituted in 1928 mainly for the preservation of *R. sondaicus* which were believed to still exist there. However, the Sanctuary was visited in 1938 in March and April by Mr. D'Arcy Weatherbe during which time he observed and measured many tracks, though not actually seeing a specimen, and as a result doubt was expressed that *R. sondaicus* existed in the area at that time. A report was made of this visit by Mr. Weatherbe and a memorandum on the Sanctuary published in *J.B.N.H.S.*, Vol. XLI, No. 1, p. 146, August 1939 (already referred to in Para 4).

In this memorandum a very detailed and searching analysis of the factors regarding the form of rhinoceros in Kahilu is made, and on reading this one is compelled to believe that the odds are on the species being *Dicerorhinus sumatrensis*.

Evidence in favour of the species being *R. sondaicus* is to a large extent based on observations of local Karens and does not carry much weight. A skull found in Kahilu in 1928 and another in 1931 were identified by Bombay Natural History Society as *R. sondaicus*, but as Mr. Weatherbe points out these do not necessarily have any bearing on the species that existed so many years later. He also points out the flaws in the visual evidence and from all this the verdict it seems must remain, if not entirely disproved, at least not definitely proved.

The small size of the posterior horn in *D. sumatrensis* and the ease with which this form can be taken for a one-horned beast must also be taken into account. I may mention that in every case of rhinoceros in Burma described to me they have been said to be 'one-horned', when in most cases there would seem no doubt that the Sumatran two-horned form was being referred to.

Farther, the Yunzalin-Salween watershed area which is only a few miles from the Kahilu Sanctuary is known as a haunt of *D. sumatrensis*; and finally, in the Game Report of 1940 the Warden got a clear view (and photographic record too) of a specimen of *Dicerorhinus sumatrensis* in a wallow, and it is added that the track of this animal was the largest measured in the Sanctuary.

Regarding other areas of Burma, Peacock states that the only definite evidence of the existence of *R. sondaicus* in Burma comes from the Thaton, Salween and Mergui Forest Divisions, and gives the forests of Victoria Point sub-division as one of the best known of its former haunts (*A Game Book for Burma*, Chap. IX). The hope that was entertained some years ago that *R. sondaicus* might have been found in the Shwe-U-Daung area seems to have remained just a hope and nothing more.

By inference, considering the former wide range of *R. sondaicus* (Bengal to Borneo and south to Java) the species probably ranged all over Burma, though apparently not in living memory. If this be true, from the absence of any very recent evidence of the form north of Thaton, it may have been that it succumbed to persecution even before the advent of firearms, to a much greater extent than *Dicerorhinus sumatrensis*.

Shortridge (*J.B.N.H.S.*, Vol. XXIII, p. 772, 1914) states that both forms were about equal in numbers in Burma and Jerdon (1874) says 'More abundantly' in Burma than Bengal.

Is one to believe that in spite of so much persecution, and the apparent helplessness of *sondaicus* in the face of it, that this form has managed to keep on existing in a small and comparatively accessible area, much of it not even reserved forest (Kahilu Sanctuary is made up of only 14 sq. miles of Reserved Forest and the rest villages, cultivation, and public forest land), where its more alert and wary relative, (*D. sumatrensis*) hardly holds its own? I think most people would say not. Certainly for practical purposes there seems no hope of any increase, even in the unlikely event of *R. sondaicus* being in the area, and this form in Burma, can be considered virtually extinct.

To sum up, it would seem that the Kahilu arêa was one of, (if not entirely) the last refuges of *Rhinoceros sondaicus* in Burma, on the evidence of the skulls.

Regarding the existence of the species in other countries, I feel that the Sundarbans of S. Bengal may offer a little hope, though little is known about the number of rhinoceros, if any, that exist there today. Rhinoceros in this area, if any exist, would almost certainly be *sondaicus* as in all the available records no specimen of either *R. unicornis* or *D. sumatrensis* has been recorded from the area.

In Siam, Malaya, and Borneo, the form has probably been wiped out though known to have existed in all these countries.

In Java and Sumatra, with the present troubles in Indonesia nothing much can be ascertained, but, on the evidence of recorded ranges of Asiatic species, any rhinoceros in Java itself would certainly be the one-horned variety, though probably in lamentably small numbers. [There is a reference to *R. sondaicus* in Java on p. 35 of the Report for the years 1940-46 International Office for the Protection of Nature (Jan. 1947).]

6. The Rumoured existence of a 'Pygmy' rhinoceros in the Salween Area.

In the Game Warden's report of 1938 there is a reference to the supposed existence of a pygmy species of rhinoceros in the north of the Salween district. A tooth found some years ago was said to resemble a wild boar tush, but was triangular in shape at the base. The B.N.H.S. was not able to identify this tooth, but Sir Frank Colyer of the Royal College of Surgeons expressed the opinion that it was the lower incisor of a rhinoceros.

The animal was described as 'about the size of a large wild boar, resembling an elephant in colour with scanty bristles on the hide which is thick and similar to that of an elephant. Head resembles that of a pig and carries no horn. Large tushes protrude upwards on either side of the jaw. Lives in dense jungle preferring hill tops, is very fierce and apt to attack on sight. Buries itself frequently in a muddy burrow during the hot weather.'

The note in the Report goes on to say that there are certain grounds (exactly what is not stated) for believing that such an animal has existed in recent years in the area of the Salween and that further enquiries were being made. Nothing more about this is recorded in subsequent Game Reports. The Karen name is given as 'Ta Kheik'.

The above description is of course interesting, and if anywhere near true would suggest an animal which properly described would certainly constitute a new species and probably a new genus. However, it seems amazing that if it exists that no specimen has come into the hands of any naturalist able to figure and describe it.

One or two possibilities are suggested from the above. There is of course a likelihood of a juvenile rhinoceros of either of the known Burmese species being indicated. This would account for the absence of any horn, but hardly for the 'large tushes' or fierce disposition, and its tendency to attack on sight. It might be referable to an abnormal specimen with deformed teeth.

The description also suggests a wild pig in many respects, including the alleged fierceness, though as in all so-called 'fierce wild beasts' an attack is seldom or never genuinely unprovoked. But the Karens are well acquainted with the pig yet say this is a form of rhinoceros. Nothing is mentioned of any folds in the skin.

The animal suggested to me by the account is the Malayan tapir (*Acrocodia*), which is the only member of the perissodactyla found in Burma apart from rhinoceros. The hind feet of the tapir are three-toed and the fore feet have four toes, but as more than one authority records that the tracks of the hind feet cover those of the fore to some extent it is possible that the tracks might be taken for three-toed spoor of rhinoceros.

Also it is not difficult to imagine a tapir seen in close jungle being mistaken for a small hornless rhinoceros, especially if the white back were covered with mud or otherwise obscured, though whether the tapir ever existed as far north as the Salween in recent years is not known. What does not seem to accord with the tapir in the description is the alleged fierce disposition, the tushes and preference for hill tops.

I have questioned several Karens of the Salween and Karenni area regarding this description but could get no information, and the name 'Ta Kheik' seems unknown to those I have asked.

I imagine this animal to be on a par with the so-called 'Nandi Bear' of East Africa (a myth based on the Spotted Hyaena) that is to say a kind of legendary and composite beast, probably based on the rhinoceros, in which have become mixed up other species such as the pig, tapir and possibly others.

7. DESTRUCTION OF RHINOCEROS IN BURMA IN RECENT YEARS.

In the period covered by the Game Warden's Reports in Burma (1928-40) there are the following records of rhinoceros destroyed.

In 1930 a male *D. sumatrensis* was shot in the Shwe-U-Daung by Mr. Peacock (then Game Warden) and the skin and skeleton presented to the British Museum. This is the only record I have of any legal killing of rhinoceros in the period under review.

The number reported killed illicitly during these years are:—

1929/30	Two
1930/31	Four
1931/32	Two
1932/33	Two
1935/36	One

These together, with the one killed in Bhamo area in 1946, and three unofficial reports I have obtained, (one in Arakan 1940, one c. 1935 in Karenni and one in the Salween area 'recently', the last two rather vague) makes a total of fifteen killed since 1928. It should be remembered that these are the known cases, no account being taken of those which have been poached and disposed of that have not been recorded.

This account omits the war years for which no information is obtainable, though there is no reason to suppose any more poaching than before took place then—one imagines that unchecked carrying of arms would not have been tolerated by the Japanese.

Previous to these years it is impossible to guess the number killed before the rhinoceros became legally (at least on paper) a protected animal. In the last 20 years, then, at least fifteen rhinoceros have been killed, probably many more, and it is very much open to question whether anything like twenty rhinoceros have been born and survived in this period.

In the Game Reports there is mention of one in 1928 and another in 1938, neither supported by very strong evidence though the latter might have been the one reported seen at the foot of Kyaikto hill in 1939. One or two young have been reported in the Shwe-U-Daung at times. General Christison records that on two occasions tracks of cows with calves at heel were observed, and then there is the report of a young one in Pegu Yomas in 1946 told to myself.

Most of these records are of course very incomplete and inconclusive. But in the areas where rhinoceros exist there is no reason why they should not, if undisturbed, go on breeding, and every reason why they should.

However allowing too for a proportion of deaths through natural causes, it is open to doubt whether the balance has been maintained.

8. PRESENT SITUATION OF RHINOCEROS IN BURMA AND PROSPECTS OF SURVIVAL.

Regarding the pre-war preservation in Burma of rhinoceros and wild life generally much has been written by far more competent pens than mine; I have already made reference to certain articles on the subject, and a list of relevant material will be found in the appendix. I have above, in para 3, given an outline of the legislative measures with which the rhinoceros are allegedly protected.

With the appointment of a whole-time Game Warden in about 1925 and the framing of the Burma Game Rules of 1927 it seemed that some progress was about to be made. But in 1931 the post of Game Warden was retrenched due to alleged financial difficulty. In the opinion of two of the writers before the war on the subject, the Game staff provided had always been totally inadequate and in his review of the Game Report for 1938 Mr. Theodore Hubback expresses sympathy with the then Game Warden (honorary after 1931) being in the position of having to build bricks without straw.

The money spent on game conservation was but a pitiful fraction of the amount derived from wild life. In the article 'Burma's decreasing Wild Life' (*J.B.N.H.S.*, Vol. XLII, pp. 155-156) Mr. D'Arcy Weatherbe gives the figure of such income from wild life as: 1935—Rs. 38,189 and 1936—Rs. 38,758. Expenditure for these years was Rs. 3,445 and Rs. 10,350 respectively, but Mr. Weatherbe points out that revenue from licences, etc., for sporting ammunition and arms is not included under 'income'. (Why it is difficult to imagine!) Further reference to these points can be seen in Pt. III of the 'Wild Animals of the Indian Empire & the Problem of their Preservation' published in *J.B.N.H.S.*, Vol. XXXVII, No. 4 as a supplement.

After pointing out these salient features and drawing attention to the references, I will not have the audacity to make any further remarks on the pre-war position, except to remark that any real interest in those days in wild life conservation seems to have been almost entirely taken by certain of the Forest Officers, and in the face of tremendous and almost insuperable difficulties. The position, if unsatisfactory then, is a thousand times worse today. There is no Game staff permanently employed, and the number of arms is absolutely out of all rhyme or reason. Licenced arms are far more numerous than they have any right to be, and the number of illicit arms is legion. True, all these illegal arms are not used primarily for game destruction, but there can be no doubt that undue toll is taken of wild life by them. Furthermore quantities of sporting ammunition are being imported and can be purchased by anyone holding a licence in far too large a quantity and irrespective of when and where it is intended to be used.

The Army has probably done its share of poaching and I believe the Pidaung Sanctuary was badly shot over during the latter part of the war. An excessive amount of shooting goes on both in and out of Reserved Forests without any doubt at all, and equally certainly in and out of season. There is today virtually no one keeping an eye on the wild life at all.

In some cases interested Forest Officers (though unfortunately not as many as one would like to see) do take an interest and do all they can to protect wild life. Usually however such officers can only devote a fraction of their time to such work, and it is then almost certainly done in their own spare time, as their duties in forest work proper must be very heavy indeed after the war, with its attendant necessary rehabilitation, catching up with work, and general sorting out to be done. Generally, it may be said that the forest officials who take any really active part in Game Conservation today are those who have a real interest and who do it more or less solely because of personal interest, and to be perfectly frank, many of these are pre-war European officials who will in the near future be terminating their stay in Burma due to the political changes taking place in the country.

Of those forest officials who take little or no active interest in conserving wild life, who can really blame them? Their duties are heavy and apart from devoting their own free time to it, they have just not got the time and facilities. In any case it is not really their job. It is the job of a Game Department.

Unfortunately so many of those who work in the forests, though often possessing excellent local and field knowledge, have little or no broad knowledge of the country's fauna as a whole, and hence no interest in the upkeep of it.

To most of them any animal (even in the case of the more primitive ones, and some of the small carnivora) is simply a lump of meat—and nothing is being done to educate them to a better appreciation of their country's wonderful wild life. Perhaps they live too close to it ever to see it in this way—I don't know. The people of Burma by their lack of interest certainly don't deserve to have such a wonderful variety of wild life as they possess at present.

One sometimes hears the case for Wild Life Conservation and strict control of shooting dismissed with the argument that the jungle peoples have always pursued game, and have not wiped it out up to now, the arguers forgetting that the jungle peoples have but recently come into the possession of modern weapons, and forgetting too the increase in population.

The jungle dweller upon getting a modern rifle or shot gun for the first time would no doubt think that his own particular brand of heaven had indeed smiled upon him to provide the means of getting unlimited quantities of meat, not realising in his ignorance that by abusing his newly acquired power he will, if allowed to surely eventually cut off the total supply.

A pair of junglefowl is regarded in the light of two meals—not in the light of the suppliers *next season* of possibly more than two meals, if spared, and consequently no regard is given to the observance of the close season, and almost never as things of beauty from the nature lover's point of view. Undoubtedly to the majority of people in Burma the reason for a close season is simply not known, or at least not fully appreciated, and, in too many cases, those who do realise the implications of allowing species to reproduce in comparative safety, do not give the correct example as they should.

I have diverted somewhat from the position of rhinoceros to that of Game in general, but let us see how the rhinoceros seems to fare in the light of the above conditions

To take first the negative prospects for the future survival of the rhinoceros in Burma:—

There is an appalling ignorance of fauna generally, and no realisation of the fact that the rhinoceros will surely be lost for ever unless means of a positive nature are taken to prevent this, and no realisation either of what the loss of a species means to science and to interested people all over the world. Because of ignorance there is apathy instead of any public feeling in the matter, and the widespread belief in the alleged 'medicinal' value of the parts of a rhinoceros does not tend to sympathy with protective measures.

The glaring loopholes in the law have already been alluded to. It has been pointed out by a very competent authority on rhinoceros, that, given that shooting of a rhinoceros anywhere in Burma without a Special Licence is illegal, and all export or import of any parts of a rhinoceros is also unlawful, it is impossible to conceive how anyone, physician or otherwise, can be in bona fide legal possession of any of the said parts of the animal.

Until enlightened legislation amends the present laws there is little hope for the species surviving, let alone increasing. Excessive arms and ammunition have already been referred to, with its attendant unlimited poaching.

There are no facilities at present for the education of the public especially the younger generation, in appreciation of wild life. Incredible as it may seem, in the city of Rangoon which rightly or wrongly boasted to be one of the finest cities of the East pre-war, there was no museum open to the public (the Veterinary Research Institute and University I believe did run small museums of their own). Compare this with the fine institutions in Calcutta and Bombay and other Indian cities, and the number of visitors to these places, and it speaks for itself.

Is any country so poor that it cannot afford to preserve its treasures of Art, Culture and Natural History, for the benefit and enjoyment of the present generation and posterity? Is it because a museum is non-political and non-profitmaking that no interest is taken in it in Burma?

The unsettled state of the country and its bearing on Wild Life Conservation generally, and rhinoceros in particular, needs no comment.

A negative factor as far as rhinoceros prospects are concerned is the possibility of separation of certain hill tracts from Burma proper—many of the present haunts of rhinoceros being in the very areas concerned. What will eventually happen I am in no position to judge, but separation of these parts would undoubtedly mitigate against rhinoceros as practically all the hill tribes of Burma are notorious poachers and have no regard for future conservation whatsoever, their ignorance and apathy in this respect, even among the educated ones being almost unbounded—not their fault of course, for they have never been educated to think other than they do.

There is a tendency in Burma not to be amenable to discipline, and to regard any restrictions imposed, however much in the public interest, as unjustified, and of which the abolition should be pressed without delay. I read in a letter to the editor published in a Rangoon paper recently, a proposal that the Government should allow everyone to carry arms with no licences or restrictions!

To consider the positive factors for the prospects of rhinoceros in Burma, one finds they are lamentably few.

Chiefly, these are the elusive and retiring habits of the rhinoceros, and in Burma, (as Mr. Hubback has written of the rhinoceros in Malaya), their survival to date has probably been due to this, plus their inaccessibility generally of location, more than to any other factor. In the case of the Shwe-U-Daung there are, too, the Spirits reputed to frown on poaching, and it is to be hoped that eventual disbelief in these spirits does not preclude some sort of desire to retain the species in Shwe-U-Daung, or they may possibly be poached out of existence.

Coupled with the remote haunts of the rhinoceros is the resultant lack of any serious conflict of interest between the claim of the species and cultivators. The fact that so much of Burma's resources and wealth lies in the forests tends to be a positive factor in so far as it ensures the upkeep and preservation of huge tracts of natural habitat, though timber cutting in any of the rhinoceros areas would no doubt disturb the animals for a time.

The rhinoceros at present do little or no harm to anyone, and any claims that rhinoceros are doing damage to cultivation should be most carefully investigated, as, there are many in Burma who would welcome any opportunity to molest this inoffensive beast.

The factor that one would expect to have a good influence on Wild Life Protection generally in Burma, but which actually seems to leave much to be desired, in this respect, is the Buddhist religion. Buddhists, according to the dictates of their religion, should kill no living thing. In a Buddhist country, therefore, one would expect some measure of protection for the fauna automatically, irrespective of legislation. The insincerity in this respect of the Buddhist religion as practised in Burma today is obvious.

From the point of view of rhinoceros in particular, the peoples occupying their habitation in the hill country are in many cases the hill tribes, for the most part either animist or Christian so the remarks about Buddhism hardly apply. Nevertheless, had the Buddhists of Burma (the vast majority of the population) not been content to sit back and watch the fauna of their country decimated by ruthless poaching and by all manner of unsporting methods, the position as a whole would have been much better.

Any future proposals for Game Preservation in Burma should endeavour to enlist the support of the Buddhist priests, who doubtless, could wield a strong influence over large sections of the populace in this direction. Before the war, I believe a few Buddhist priests did do a little in this way and tried to establish small local sanctuaries. Such efforts deserve all possible support (including official recognition).

That rhinoceros will respond to strict protection is shown by the facts about the following efforts at conservation in India and elsewhere. (Admittedly I quote reserves for other species.)

The Kaziranga Reserve for *R. unicornis* in Assam is full of the species today, and by all reports they are steadily on the increase. Last year two separate parties were quoted in the *Journal* of the Society for the Preservation of the Fauna of the Empire as having, (from an elephant) each seen a number of rhinoceros (including some calves) in a very short time, one party seeing eleven in the course of a brief visit of a few hours only.

Poaching of rhinoceros in Nepal has, I believe, been eliminated, due to the Government having the power to enforce its own laws.

The Jaldapara Sanctuary in North Bengal is also for *R. unicornis* and was constituted in 1932 to save the rhinoceros in the area from being poached out. In 1930-31 about fifty were killed, this number of skulls being found in 1932 and 33. Before this it had been estimated there were 80 specimens in the area, so the extent of the reduction can be realised.

After the 14 years or so of preservation it is estimated that today there are about fifty in the Sanctuary.

It would seem that the rhinoceros (at least *R. unicornis*) is a steady, if slow, breeder and this doubtless augmented by the probability of few dangers to the calves, in the way of natural enemies.

I have not much information about the present state of protection of the two African species but it would appear that both the Northern and Southern races of the rare *Ceratotherium simum,* (the 'white' rhinoceros) are fairly well provided for and in no immediate danger. It is of interest to note that the Southern race of *C. simum* has often been written of as 'totally extinct' or 'dying out'; while in actual fact there are probably more of them in existence than there are *D. sumatrensis* in the whole of Burma, and there is every prospect that these African square lipped monsters will not be allowed to perish at the hands of man.

Through the wastefulness and greed of man, *Rhinoceros sondaicus* has been exterminated in Burma. A former Game Warden (Mr. E. H. Peacock) records his opinion that had the necessary steps been taken they could have been saved. It is not quite too late to save *Dicerorhinus* from extinction in Burma but certain steps are essential if this is to be effectively carried out.

Most of the following has been pointed out before, but it does no harm to repeat it once again.

It is absolutely imperative that a Game Warden and Game Staff be appointed without delay, and that sufficient funds be set aside for Wild Life Protection, from revenues derived from wild life (sporting arms licences, game licences, elephant kheddah licences, etc.).

As has been so often pointed out, all this revenue is a *direct* result of the existence of wild life, and unless ample provision is made to safeguard it, it will be so nearly exterminated in a few years that this source of revenue will have ceased to exist. If the Government of Burma must be mercenary about it, why cannot wild life be regarded as a natural resource of the country, much on a par with the forests One does not expect to go on deriving revenue from the forests without maintaining a Forest Department. It is illogical to expect revenue from wild life to continue if nothing is done about its upkeep.

Could not the Government be content with a small annual revenue for transfer to other departments and regard the wild life in the light of a long term investment? No one has ever advocated a Game Department that does not pay for itself, and it should be possible also to make a little over which could then be transferred to any other department at the discretion of those responsible for such matters.

As far as wild life in Burma is concerned the policy today is of killing the goose that lays the golden eggs. A revision of the futile and inadequate legislation concerning rhinoceros in Burma coupled with a realisation that the best laws are of little use unless the machinery exists to enforce such legislation, is an essential measure to save the species.

The issue of sporting arms and licences should be strictly controlled, and their issue coordinated with the relative stock of game in the areas over which it is proposed to allow shooting.

There should be an effort made to educate the people of Burma in appreciation of wild life, and an attempt to eliminate the prevalent idea of fauna (and flora too) being the property of anyone who can and cares to take it for himself. At present there is no idea at all that the fauna and flora belong to, and are an integral part of the country as a whole.

The formation of a Wild Life Protection Society and/or a Natural History Society would be a great step forward, but like so much else in Burma, such may be (and, I believe, in the past has been) talked of for years and nothing done. It should be remembered that such movements are almost invariably the result of the labours of a very few interested people in the first instance.

Finally, no effort should be spared to keep the present sanctuaries intact, improve them and where necessary form new ones. They should all belong to some sort of National Trust and remain permanently inviolate. The ultimate aim should be to make National Parks of those suitable for such.

I have heard of proposals to exploit timber or other forest resources in both the Shwe-U-Daung and Kahilu Sanctuaries. There is nothing whatsoever to justify this step, and it would be folly to allow it to be done. A wild life sanctuary implies that the flora as well as the fauna should remain as Nature made it. Is anyone in his right mind to believe that any timber concern is really going to stand or fall by the amount of teak, etc., that can be got out of so few square miles, considering the total huge forested areas in Burma? One can only hope that commercial interests will not be allowed to get their greedy hands on these sanctuaries.

It is probable that in ten or fifteen years' time Burmans visiting, say, the National Parks of Canada or U.S.A. will ask 'Why can't we have some National Parks like these in Burma?' and the answer will be: 'You could have had, if farsighted and wise measures were taken a few years ago, but it is too late now, the opportunity is gone forever.'

It would, indeed, be a sad reflection on past policy if, when the time comes that people in Burma have the leisure and desire for National Parks nothing worthwhile were left to show them.

If the above necessary measures are carried out it would seem that there is a good chance of keeping the Burmese rhinoceros in the Shwe-U-Daung, Uyu area and the Arakan in perpetuity and there might be some chance of an increase in the stock in these areas. In all these places there seems every opportunity for them to breed if undisturbed.

If, as I am compelled to believe will be the case, nothing is done it will mean that the ultimate fate of *Dicerorhinus sumatrensis* will be the same as of its larger relative *Rhinoceros sondaicus,* though a few isolated specimens may remain in the more remote tracts for several years before finally succumbing to the inevitable.

APPENDIX A.

REFERENCES TO RHINOCEROS IN BURMA AND RELEVANT LITERATURE.

Jerdon.—Mammals of India, p. 234 (1870).

Sterndale.—Mammalia of India, p. 405 *et. seq.* (1884).

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Stockley.—Big Game Shooting in the Indian Empire (1928).

Peacock, E. H.—A Game Book for Burma, Chapters viii and ix (1933).

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P.Z.S.—1869 p. 409; 1873, p. 104; 1875, p. 566.

J.B.N.H.S.—Vol. xvi, p. 555, 'Notes on Rhinoceros in Burma' (Major G. H. Evans, F.L.S.) (1905).

J.B.N.H.S.—Vol. xxiii, p. 772, 'The Asiatic Two-horned Rhinoceros' (*R. sumatrensis,* Cuv.) by G. C. Shortridge (1914).

J.B.N.H.S.—Vol. xxxviii, No. 1, p. 137, 'Rhinoceros Shooting in Burma', by W. S. Thom (1935).

J.B.N.H.S.—Vol. xxxix, No. 3, p. 606, 'Note on the Burma Wild Life Protection Act' (1938).

J.B.N.H.S.—Vol. xl, No. 4, p. 594, 'The Two-horned Asiatic Rhinoceros (*Dicerorhinus sumatrensis*)' by Theodore Hubback (1939).

J.B.N.H.S.—Vol. xl, No. 4, p. 618, 'Additional notes on the Asiatic Two-horned Rhinoceros', by S. H. Prater, C.M.Z.S. (1939).

J.B.N.H.S.—Vol. xli, No. 1, p. 146, 'Memorandum on the Kahilu Sanctuary', by D'Arcy Weatherbe (1940).

J.B.N.H.S.—Vol. xli, No. 1, p. 161, 'Review of the Annual Report on Game Preservation in Burma for the year ended 31st March 1938' by Theodore Hubback, (1940).

J.B.N.H.S.—Vol. xlii, p. 150, 'Burma's Decreasing Wild Life' by D'Arcy Weatherbe (1940).

J.B.N.H.S.—Vol. xliv, p. 257, 'A Few Notes about the Five Rhinoceros of the World' by W. S. Thom (1943).

'Wild Animals of the Indian Empire and the problem of their Preservation', Pt. III, Supplement to *J.B.N.H.S.*, Vol. xxxvii, pp. 112-188.

Journal of the Society for the Preservation of the Fauna of the Empire June 1946, Pt. III, p. 46.

Journal of the Society for the Preservation of the Fauna of the Empire Dec. 1946.

APPENDIX B.

ADDITIONAL DATA ON *Rhinoceros sondaicus*.

Published in the *Journal* of the Malayan branch of the Royal Asiatic Society (Vol. XV, p. 130, *et seq.*) in 1937 was an article entitled '*Rhinoceros sondaicus,* The Javan or Lesser One-horned Rhinoceros and its Geographical Distribution' by Charles W. Loch.

This article came to my notice after the MS of my notes relating to the rhinoceros in Burma had been completed and, though it is not primarily concerned with Burma, I feel that it is of such considerable interest (and probably not obtainable by many at the present time) that a short note on the gist of the article may appropriately form an appendix to my notes.

The article gives a full and interesting survey of the recent range of *R. sondaicus*.

Records of specimens that were actually killed and identified are quoted from Bengal (latest 1874), Assam (latest 1874, Manipur) Burma (latest 1920, shot by Mr. Hubback at Victoria Point), Siam, Malaya (several good records, latest 1932), Sumatra (latest 1933), Java, Indo-China and Borneo (doubtful, with a remark that Mr. E. Banks, of the Sarawak Museum, did not believe *R. sondaicus* to exist in Borneo really).

Mr. Loch estimated that at that time (1937) there were about 66 ('probably less than 70 and more than 40') in existence made up of 4 in Burma, 6 in Malaya, about 6 in Sumatra, about 24 in Java, 8 in Siam, and about 18 in Indo-China.

He considered the species extinct in Bengal and probably so in Assam, probably non-existent in Borneo and had no records from Yunnan and Kwang-si.

This estimate would seem to be very optimistic, especially if the evidence in the other countries was no more reliable than that from Burma was shown to be when analysed by Mr. Weatherbe.

In any case it appears almost certain that today (ten years later) nowhere near sixty of this rare mammal exist.

It is particularly regrettable that the areas where the article quoted *Rhinoceros sondaicus* as being most plentiful (Fr. Indo-China and Java) are today the very areas where there is most trouble and unrest, and just the places where the species would seem to have the least chance of survival. Especially is it unfortunate in the case of the Cedjoenkoelon Peninsula of Java, where there was reported to have been a dozen or more *R. sondaicus* in a reserve, formerly closely guarded and protected. (All the rhinoceros of Java would belong to the *sondaicus* variety on the evidence of *D. sumatrensis* never having been recorded from the island.)

The article under reference gives a map, and two plates of mounted specimens, (m. & f.) of *R. sondaicus*, and a table showing the known specimens in the museums of the world. There is also a list of references to literature on the subject.

THE BIRDS OF DELHI AND DISTRICT

BY

N. F. FROME, C.I.E., D.F.C., M.SC., M.B.O.U.

(*With a map and* 4 *sketches*)

In volume xxxi of the *Journal* an article written by the late S. Basil-Edwardes was published under the title 'A Contribution to the Ornithology of Delhi' giving a list of the birds of Delhi and district. Basil-Edwardes's record was, however, confined only to the winter season of 1924-25 and omits a number of species which occur in the Delhi area, apart from its lack of information as regards status. There seems to have been no collected data published since on the birds to be seen in and around Delhi.

The following account, which has been compiled from the notes of H. A. C. Gill, I.C.S., J. D. Michael, O.B.E., R. S. Symons, C.I.E., I.C.S., Sir Andrew Clow, K.C.S.I., C.I.E., I.C.S., C. R. Cooke, O.B.E., and the author, expands Basil-Edwardes's paper and brings it up to date.*

The area to which the present record applies is that contained in a circle roughly 30 miles around Delhi (*vide* map). This area consists mostly of the flat country of the Gangetic plain with the rocky outcrop of the Delhi Ridge and its extensions. Within the area lie parts of the river Jumna, the smaller Hindan river, sections of the Eastern Jumna, Western Jumna and Agra canals, a number of jheels, extensive cultivation, light woodland, gardens and residential areas, arid rocky and scrub country and the grasslands of the riverain tracts. There is no forest in the area.

The observations regarding the different species combine the results of independently maintained notes of sight records extending from about 1931 to the present time (December 1945). The list records 300 species divided into the following classes:—

Residents	132
Spring visitors	2
Summer visitors	5
Rains visitors	5
Winter visitors	109
Non-seasonal visitors	2
Passage migrants	24
Status not known	21

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* In order to make this list more comprehensive, some additional species observed by Major-Gen. H. P. W. Hutson, C.B., D.S.O., O.B.E., M.C., during the two seasons June 1943 to May 1945 together with his remarks have been inserted in square brackets in their proper places.—EDS.

The normal habitat of each species has been indicated and, subject to observation in suitable habitat, the following scale has been used to indicate the frequency of occurrence :—

Very common ...	seen in abundance.
Common ...	seen frequently.
Fairly common ...	seen fairly frequently.
Not at all common ...	seen only occasionally.
Uncommon ...	seen very rarely.
Very uncommon ...	seen only on one or two isolated occasions.

The term 'small parties' describes groups up to a dozen individuals; 'small flocks' from 12 to 50, and 'large flocks' more than 50.

Species have been listed in the order given in the *Fauna of British India* (*Birds*), second edition, and those additional to Basil-Edwardes's list, of which there are 98, are indicated by an asterisk.

The text is illustrated by sketches giving field impressions of a few species by C. R. Cooke.

Although the present record is fairly comprehensive additional information is required in many instances, particularly as regards the occurrence of warblers, pipits, larks, owls, eagles and duck, and as regards nests and nesting seasons. In addition, the periods in which visitors have been noted can no doubt be extended in many cases. It would be of value, therefore, if others interested in the birds of Delhi and district would add their data to this list in these and other respects.

Corvus corax Linnaeus. The Raven.

Occasional winter visitor. Very uncommon. One doubtful observation in open country near Gurgaon, solitary, in December (23rd); pair near Haus khas in January (26th).

Corvus macrorhynchos Wagler. The Jungle Crow.

Resident. Uncommon. Occurs very occasionally in open country and cultivation. Solitary, and small parties.

Corvus splendens Vieillot. The Common House Crow.

Resident, Very common in all inhabited and cultivated areas. Gregarious.

Dendrocitta vagabunda (Latham). The Indian Tree Pie.

Resident. Fairly common in gardens and woodland. Solitary and pairs.

Sitta castanea Lesson. The Chestnut-bellied Nuthatch.

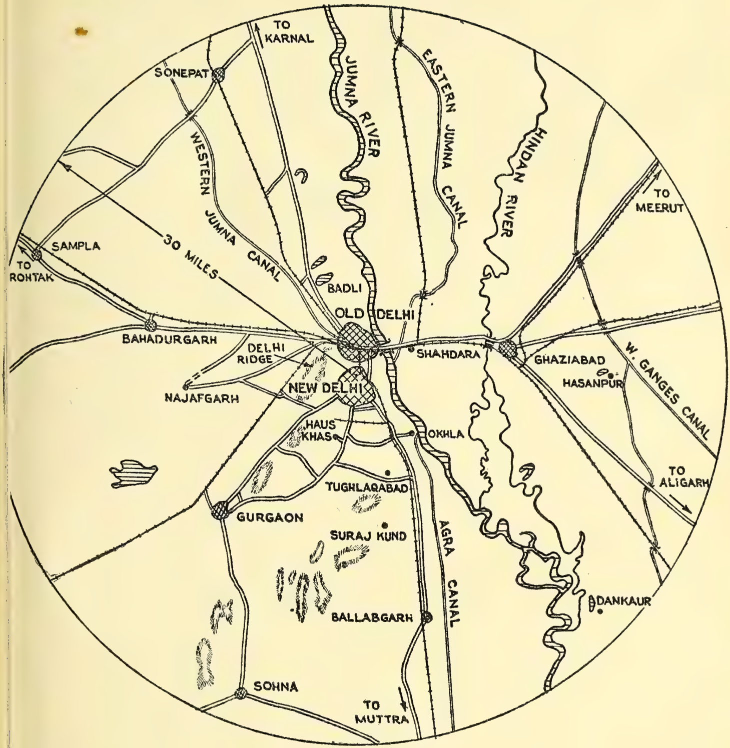
Resident. Not at all common, but occurs particularly in tree avenues along canals. Solitary.

Turdoides somervillei (Sykes). The Jungle Babbler.

Resident. Very common in gardens in Old Delhi and common around garden and bush cover elsewhere. Small parties.

***Argya earlii** (Blyth). The Striated Babbler.

Resident. Not at all common. Occurs in reed and rush beds along river banks in small parties.


TO KARNAL
SONEPAT
JUMNA RIVER
EASTERN JUMNA CANAL
HINDAN RIVER
WESTERN JUMNA CANAL
TO MEERUT
30 MILES
SAMPLA
TO ROHTAK
BADLI
OLD DELHI
BAHADURGARH
DELHI RIDGE
SHAHDARA
GHAZIABAD
HASANPUR
W. GANGES CANAL
NAJAFGARH
NEW DELHI
HAUS KHAS
OKHLA
TUGHLAQABAD
TO ALIGARH
GURGAON
SURAJ KUND
AGRA CANAL
BALLABGARH
DANKAUR
SOHNA
TO MUTTRA

DELHI AND DISTRICT

0 1 2 3 5 10 15
SCALE MILES

Argya caudata (Dumont). The Common Babbler.

Resident. Common in small parties in dry open country in scrub, bushes and sirkanda grass.

Argya malcolmi (Sykes). The Large Grey Babbler.

Resident. Very common in small parties in lightly wooded jungle tracts and in gardens in New Delhi.

***Chrysomma sinensis** (Gmelin). The Yellow-eyed Babbler.

Resident. Fairly common in gardens, thick bush and jungle cover. Pairs and small parties.

Ægithina nigrolutea (Marshall). Marshall's Iora.

Resident. Not at all common. Occurs in woodland in country districts. Solitary and pairs.

[**Chloropsis aurifrons** The Gold-fronted Chloropsis.

Vagrant. A single bird seen in August. Possibly an escape.]

Molpastes cafer (Linnaeus). The Red-vented Bulbul.

Resident. Very common in gardens and cultivated areas. Solitary, pairs and occasional small parties.

Molpastes leucogenys leucotis (Gould). The White-eared Bulbul.

Resident. Fairly common in gardens, cultivation and dry open scrub country. Solitary and pairs.

***Otocompsa jocosa** (Linnaeus). The Red-whiskered Bulbul.

Resident. Occasionally seen in gardens in New Delhi but not recorded elsewhere. This species seems to be a new arrival in the Delhi area being noted only since 1941. Nests : May.

[**Certhia himalayana** Vigors. The Himalayan Tree-Creeper.

Vagrant. A single bird in light woodland, 4 June.]

Salpornis spilonotus Franklin. The Spotted Grey Creeper.

Presumably scarce resident—recorded in December, January, April and July chiefly in woodland in country districts. Solitary and pairs.

***Tichodroma muraria** (Linnaeus). The Wall Creeper.

Winter visitor. Uncommon. Recorded on various dates from December (6th) to March (8th) on New Delhi Secretariat Buildings. Solitary.

Saxicola caprata (Linnaeus). The Pied Bush-Chat.

Resident. Common in open scrub country particularly in riverain areas. Solitary and pairs. Nests (4 eggs) : March (young) ; May.

Saxicola torquata (Linnaeus). The Stone-Chat.

Winter visitor. Fairly common in open scrub country particularly in riverain areas from November (18th) to April (16th). More common as passage migrant during the first fortnight of April. Solitary.

[**Rhodophila ferrea** (Gray). The Dark Grey Bush-Chat.

Passage Migrant. Seen in April and September. Scarce (identifications not sure).]

Œnanthe picata (Blyth). The Pied Wheatear.

Winter visitor. Uncommon. Noted in October (13th) to January in open rocky country. Solitary.

Œnanthe capistrata (Gould). The White-capped Wheatear.

Occasional winter visitor. Very uncommon. Noted on one occasion only in open country near Najafgarh (January). Solitary.

***Œnanthe opistholeuca** (Strickland). Strickland's Wheatear.

Winter visitor. Not at all common. Noted in open rocky country, October (6th) to February. Solitary.

Œnanthe isabellina (Cretzschm.) The Isabelline Wheatear.

Occasional winter visitor. Doubtfully observed by Basil-Edwardes in December. No subsequent records.

Œnanthe deserti (Temm. & Laug.). The Desert Wheatear.

Winter visitor. Not at all common but occasionally observed from November (15th) to February (26th) in arid and sandy open country. Solitary.

Cercomela fusca (Blyth). The Brown Rack-Chat.

Resident. Common around gardens, houses and old buildings. Usually in pairs. Nest (4 eggs): March.

Phoenicurus ochruros (Gmelin). The Black Redstart.

Winter visitor. Common in gardens and woodland—September (16th) to April (22nd). Solitary.

Cyanosylvia suecica (Linnaeus). The Bluethroat.

Winter visitor. Common in undergrowth of gardens and in reed and bush cover in riverain areas from September (15th) to April (24th). Particularly common on passage from mid-March to end of April. Solitary.

***Calliope calliope** (Pallas). The Common Rubythroat.

Presumably passage migrant or winter visitor. Uncommon. Noted only on two occasions in November (4th and 17th) in scrub jungle in lightly wooded country. Solitary.

Saxicoloides fulicata cambayensis (Latham). The Brown-backed Indian Robin.

Resident. Common. Occurs in gardens and also in arid scrub country. Solitary and pairs.

Copsychu saularis (Linnaeus). The Magpie Robin.

Chiefly winter visitor (October to April) with some residents. Fairly common in gardens and cultivation. Solitary and pairs.

Turdus atrogularis Jarocki. The Black-throated Thrush.

Occasional winter visitor. Uncommon. Observed in gardens and parks in New Delhi on a few occasions from February (15th) to March (21st). Solitary.

***Turdus unicolor** Tickell. Tickell's Thrush.

Occasional winter visitor. Uncommon. Noted only on two occasions in gardens in New Delhi in February (2nd) and in March. Solitary.

***Geokichla citrina** (Latham). The Orange-headed Ground-Thrush.

Occasional winter visitor. Uncommon. Noted only in New Delhi gardens during winter of 1940-41.

Monticola solitaria (Linnaeus). The Blue Rock-Thrush.

Winter visitor. Not at all common. Occurs on rocky ground and around old buildings in open country. Noted from January (21st) to May (1st). Solitary.

Muscicapa parva Bechstein. The Red-breasted Flycatcher.

Winter visitor. Not at all common. Seen occasionally from October (30th) to April (2nd), in trees and bushes in lightly wooded country. Solitary.

Eumyias thalassina (Swainson). The Verditer Flycatcher.

Passage migrant. Not at all common. Noted on a few occasions in gardens and parks in New Delhi and in woodland in country districts during October (6th) and March (18th to 26th). Solitary.

Culicicapa ceylonensis (Swainson). The Grey-headed Flycatcher.

Occasional winter visitor. Not at all common. Seen on a few occasions in fruit gardens and light woodland from October (19th) to March. Solitary.

Tchitrea paradisi (Linnaeus). The Paradise Flycatcher.

Chiefly passage migrant with some summer visitors. Not at all common. Occasionally seen in gardens in New Delhi and fruit gardens in country districts in April (5th to 21st) and September (15th to 28th). More infrequently from April to September. Usually solitary.

Leucocirca aureola (Lesson). The White-browed Fantail Flycatcher.

Resident. Fairly common in gardens, plantations and woodland. Solitary.

Lanius excubitor Linnaeus. The Great Grey Shrike.

Resident. Fairly common in kikar trees and bushes in arid country and riverain tracts. Solitary. Nest; in occupation, May (10th).

Lanius vittatus Valenciennes. The Bay-backed Shrike.

Resident. Common—in gardens and trees in cultivation. Solitary.

Lanius schach Linnaeus. The Rufous-backed Shrike.

Chiefly winter visitor with some residents. Not at all common during summer months but fairly common from November to March in gardens and light woodland. Solitary. Nest (young): June (26th).

[**Lanius cristatus** Linn. The Brown Shrike.

Winter visitor. Mid-August to mid-March. Small numbers about edges of jheels and reed beds.]

Lanius isabellinus Hemprich & Ehrenberg. The Pale Brown Shrike.

Winter visitor. Not at all common. Noted occasionally perched on bushes in open country from November (10th) to March (14th). Solitary.

Tephrodornis pondicerianus (Gmelin). The Common Wood-Shrike.

Resident. Fairly common in gardens, copses, and cultivation. Solitary.

Pericrocotus brevirostris (Vigors). The Short-billed Minivet.

Winter visitor. Not at all common. Small parties of mixed sexes seen occasionally in gardens, parks and woodland from November to March (14th).

***Pericrocotus roseus** (Vieillot). The Rosy Minivet.

Presumably occasional winter visitor. Very uncommon. Seen on one occasion only in December in open country near Badli jheel. Solitary.

Pericrocotus peregrinus (Linnaeus). The Little Minivet.

Resident. Fairly common in small parties in garden trees and woodland but more evident in cold weather than remainder of year.

Pericrocotus erythropygius (Jerdon). The White-bellied Minivet.

Winter visitor. Not at all common. Occasionally seen in small parties and pairs in parks and woodland in country districts from November (11th) to February (19th).

[**Graucalus javensis** The Large Cuckoo-Shrike.

Not seen but reliably reported by other observers.]

Dicrurus macrocercus Vieillot. The Black Drongo.

Resident. Very common in all types of country. Usually solitary. Birds in juvenile plumage, September (8th).

***Dicrurus coerulescens** (Linnaeus). The White-bellied Drongo.

Occasional visitor. Not at all common. Seen only on two occasions in light woodland in country districts in August (8th), and in November (3rd). Solitary.

***Acrocephalus stentoreus** (Hempr. & Ehr.). The Indian Great Reed Warbler.

Probably passage migrant. Uncommon. Noted in reed beds of Hindan river and at Okhla in April (28th and 29th). Solitary.

Acrocephalus dumetorum Blyth. Blyth's Reed Warbler.

Presumably passage migrant. Doubtfully observed by Basil-Edwardes in March (25th). No subsequent records.

[**Locustella naevia** (Boddaert). The Grasshopper-Warbler.

Passage migrant. Two records : A bird on 14 April and another on 16 April.]

Orthotomus sutorius (Pennant). The Tailor Bird.

Resident. Common, particularly in gardens. Solitary and pairs.

[**Lusciniola melanopogon** (Temm. & Laug.). The Moustached Sedge-Warbler.

Resident. Noted in January, April and first half of May and suspected during other months of the year. Small numbers in a few reed-beds by water.]

Cisticola juncidis (Rafinesque). The Streaked Fantail-Warbler.

Resident. Fairly common in open grassland. Solitary and pairs.

Franklinia buchanani (Blyth). The Rufous-fronted Wren-Warbler.

Resident. Common in scrub covered arid country in small parties.

Hippolais caligata (Lichtenstein). The Booted Warbler.

Status uncertain. Uncommon. Noted only in October (18th) in light woodland. Solitary.

***Sylvia hortensis** (Gmelin). The Orphean Warbler.

Presumably winter visitor. Uncommon. Noted only on one occasion in riverain tract in February (10th). Solitary.

Sylvia curruca (Linnaeus). The Lesser Whitethroat.

Winter visitor. Common in woodland in country districts and in garden trees from September (30th) to April (7th). Usually solitary.

Phylloscopus collybita (Vieillot). The Chiffchaff.

Winter visitor. Common in bushes, garden trees and copses from September (5th) to April (13th). Usually solitary.

Phylloscopus griseolus Blyth. The Olivaceous Willow-Warbler.

Presumably passage migrant. Observed by Basil-Edwardes towards the end of March. No subsequent records.

Phylloscopus humii (Brooks). Hume's Willow Warbler.

Winter visitor. Heard throughout the cold weather by Basil-Edwardes. Noted in garden trees in New Delhi and in woodland in country districts in December and February (10th).

Phylloscopus trochiloides (Sundevall). The Green Willow Warbler.

Passage migrant. Noted by Basil-Edwardes during March and April on migration. No subsequent records.

***Phylloscopus occipitalis** (Blyth). The Large Crowned Willow-Warbler.

Winter visitor. Not at all common. Noted in tree groves in riverain and canal areas from January (3rd) to March. Solitary.

Prinia gracilis (Lichtenstein). The Streaked Wren-Warbler.

Presumably resident. Not at all common. Noted only in overgrown grassland and in sirkanda grass thickets at Hindan river in February (7th and 22nd). Solitary.

Prinia socialis Sykes. The Ashy Wren-Warbler.

Resident. Common in gardens and in hedges in cultivation. Solitary.

Prinia inornata Sykes. The Indian Wren-Warbler.

Resident. Common. Occurs particularly in grass and reed clumps in riverain areas and in crops. Nest (4 young): August (6th).

Oriolus oriolus (Linnaeus). The Golden Oriole.

Summer and rains visitor. Common in garden trees, copses and woodland, from April (2nd) to October (11th). Solitary and pairs.

Pastor roseus (Linnaeus). The Rosy Pastor.

Chiefly passage migrant. Common on northern migration in small and large flocks from mid-March to end of April—in some years to first week of May. Common during southern migration (particularly south of New Delhi) from the last week in July to mid-October. Very occasionally seen during cold weather: small flock in November, solitary immature bird in December (27th) small flock in January. Usually seen in flight, resting on trees or feeding on ground during southern migration; in flight or resting and feeding on flowering trees during northern migration.

Sturnus vulgaris Linnaeus. The Starling.

Winter visitor. Common in grassland and open country, from October (16th) to March (3rd). A number of very large flocks seen north of Old Delhi flying west to east October (16th). Occurs in small flocks November to January. Gathers in large flocks before migration in February. Latest date flocks seen March (3rd).

***Sturnia malabarica** (Gmelin). The Grey-readed Mynah.

Occasional visitor. Very uncommon. Noted only on one occasion on the Ridge at New Delhi in September.

Temenuchus pagodarum (Gmelin). The Brahminy Mynah.

Resident. Common in gardens, cultivation and grassland. Singly, pairs and small parties.

Acridotheres tristis (Linnaeus). The Common Mynah.

Resident. Very common in all types of country, towns and habitations. Pairs. Flights to roosting sites in flocks.

Acridotheres ginginianus (Latham). The Bank Mynah.

Resident. Common—usually in the neighbourhood of water. Also conspicuous at Delhi railway station. Small parties; often roosts in reed beds in large flocks. Nests (with young): June (28th).

Sturnopaster contra (Linnaeus). The Pied Mynah.

Resident. Common around jheels and in riverain areas. Pairs, and small parties. Nests: April to July.

Ploceus phillippinus (Linnaeus). The Baya Weaver Bird.

Resident. Common in small parties and flocks. Usually to be seen at nesting sites and feeding on flowering sirkanda grass. Nesting season; July to September.

Ploceus bengalensis (Linnaeus). The Black-throated Weaver Bird.

Status not known. Basil-Edwardes refers to specimen in Hume collection. No subsequent records.

Ploceus manyar (Horsfield). The Striated Weaver Bird.

Presumably resident. Not at all common. Nesting colony observed in reed bed near Okhla, July, August and September. Small parties.

[**Munia malacca** (Linn.). The Chestnut-bellied Munia.

Vagrant. Single bird (probably) on 25 June and 2 July.]

Uroloncha malabarica (Linnaeus). The White-throated Munia.

Resident. Common. Occurs in small parties in dry, open scrub country—often to be seen feeding on flowering sirkanda grass. Nests: March.

***Uroloncha punctulata** (Linnaeus). The Spotted Munia.

Probably resident. Uncommon. Has been observed in December, April (3rd) and May (29th), in country districts usually feeding on sirkanda grass seeds. Solitary.

Amandava amandava (Linnaeus). The Red Munia.

Resident. Not at all common. Occasionally seen in small parties—usually around patches of sirkanda grass in the neighbourhood of water.

Carpodacus erythrinus (Pallas). The Common Rosefinch.

Passage migrant. Not at all common. Noted by Basil-Edwardes in January (24th and 31st). Occurs in present records on a number of occasions from March (26th) to April (18th). Small parties, in light woodland.

Bucanetes githaginea (Lichsten). The Eastern Desert-Finch.

Status not known. Basil-Edwardes refers to Hume's record from Gurgaon district in 1877. No subsequent records.

Gymnorhis xanthocollis (Burton). The Yellow-throated Sparrow.

Resident. Fairly common. Occurs in open country and around cultivation. Solitary and pairs.

Passer domesticus (Linnaeus). The House Sparrow.

Resident. Very common in towns, around habitations, and in the country feeding on crops. Small parties and small flocks.

***Emberiza stewarti** Blyth. The White-capped Bunting.

Chiefly passage migrant. Uncommon. Very occasionally seen in open scrub country; once in January but more frequently in March (5th to 26th). Usually solitary.

Emberiza cia Linnaeus. The Meadow Bunting.

Occasional winter visitor. Very uncommon. Doubtfully observed on the Ridge in December on one occasion only. Basil-Edwardes refers to specimen obtained by Cole in February (24th). Solitary.

***Emberiza brunniceps** (Eversmann). The Red-headed Bunting.

Passage migrant. Fairly common in April (3rd to 30th), usually in small flocks in crops and feeding on sirkanda grass seeds. Also observed (solitary) in November (21).

[**Emberiza melanocephala** Scopoli. The Black-headed Bunting.

Vagrant. A single bird on 2 April with flock of *E. brunniceps.*]

***Melophus lathami** (Gray). The Crested Bunting.

Passage migrant. Uncommon. Seen very occasionally in April (4th to 16th) in open country. Solitary.

Riparia paludicola (Vieillot). The Indian Sand Martin.

Resident. Common around the Jumna and Hindan rivers, Agra canal, etc., in colonies. Nesting season: November to March.

Riparia concolor (Sykes). The Dusky Crag Martin.

Resident. Not at all common. Occurs around old buildings. Usually in pairs.

Hirundo rustica Linnaeus. The Common Swallow.

Winter visitor with increased numbers during spring migration. Not at all common. Noted occasionally near River Jumna in January; large flocks seen in April (14th). Recorded by Basil-Edwardes in November.

Hirundo smithii Leach. The Wire-tailed Swallow.

Resident. Fairly common—usually found in open country in the vicinity of water, solitary, pairs and small flocks.

***Hirundo fluvicola** Jerdon. The Cliff Swallow.

Noted chiefly during rains and cold weather but presumably resident. Usually observed in colonies around large clusters of nests under the arches of bridges over water. Nest colony noted in August; also building in November and in occupation to February.

Hirundo daurica Linnaeus. The Red-rumped Swallow.

Resident. Common particularly around old buildings and jheels. Collects in small and large flocks which frequently perch in rows on telegraph wires. Nest: March. *H. d. nipalensis* occurs as winter visitor (specimen obtained by Basil-Edwardes in March).

Motacilla alba Linnaeus. The White Wagtail.

Winter visitor. Common in gardens, pastures and around jheels etc.; solitary and small parties. Noted from September (5th) to April (28th).

Motacilla maderaspatensis Gmelin. The Large Pied Wagtail.

Resident. Fairly common around rivers, jheels and ponds. Solitary and pairs. Nest (Basil-Edwardes): February (27th).

***Motacilla cinerea** Tunstall. The Grey Wagtail.

Presumably passage migrant. Uncommon. Noted only in April (21st) on flooded ground in gardens in New Delhi. Solitary.

Motacilla flava Linnaeus. The Yellow Wagtail.

Winter visitor. Common around jheels, marshy ground and in gardens. Observed from September (8th) to May (7th). Solitary, small parties, and occasionally large flocks. Both *M.f. thunbergi* and *M.f. beema* have been distinguished in March.

Motacilla citreola Pallas. The Yellow-headed Wagtail.

Chiefly passage migrant. Fairly common around jheels and marshes from March (7th) to May (7th). Solitary or 2 or 3 individuals.

Anthus trivialis (Linnaeus). The Tree Pipit.

Winter visitor. (Noted by Basil-Edwardes as common.) Not distinguished with certainty from *A. hodgsoni.*

Anthus hodgsoni Richmond. The Indian Tree Pipit.

Winter visitor. Not at all common. Seen occasionally in lightly wooded country from December (2nd) to April (18th). Solitary and small parties.

Anthus similis Jerdon. The Brown Rock Pipit.

Presumably winter visitor. Not at all common. Specimens obtained by Basil-Edwardes in November and February. Observed in open rocky country in October (6th).

Anthus rufulus Vieillot. The Indian Pipit.

Resident. Fairly common in grassland and cultivated tracts. Solitary.

Anthus campestris Linnaeus. The Tawny Pipit.

Winter visitor. Uncommon. Noted only in open ground of riverain areas in October. Specimens obtained by Basil-Edwardes in November and doubtfully seen in February.

***Alauda gulgula** Franklin. The Little Skylark.

Resident. Fairly common in grassland and open cultivated tracts. Solitary.

Calandrella brachydactyla (Leisler). The Short-toed Lark.

Winter visitor. Not at all common. Noted only in February. Large flocks in stubble of fallow fields.

Calandrella raytal (Blyth). The Sand Lark.

Resident. Fairly common on sandbanks of river Jumna and in tamarisk scrub. Solitary, pairs and scattered small parties.

Mirafra erythroptera Blyth. The Red-winged Bush Lark.

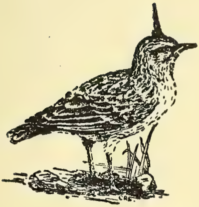
Status not known. Not at all common. Observed only in open country and in riverain areas in February (17th), August and September. Solitary.

Galerida cristata (Linnaeus). The Crested Lark.

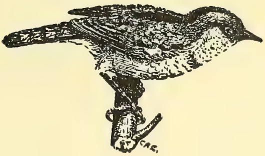
Apparently winter visitor. Fairly common in open grassland, cultivation and riverain tracts from September (30th) to April (23rd). Not evident during summer and rains. Solitary and scattered small parties.

***Ammomanes phoenicura** (Franklin). The Rufous-tailed Finch-Lark.

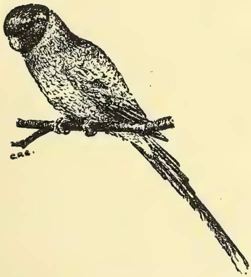
Status not known. Uncommon. Seen only on one occasion in open country near Suraj Kund in August (29th). Pairs.



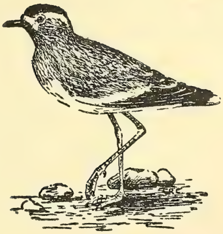
Crested Lark



Wryneck



Blossom-Headed Parakeet



Yellow Wattled Lapwing

Eremopterix grisea (Scopoli). The Ashy-crowned Finch-Lark.

Resident. Fairly common in dry open country and fallow fields. Small parties and small flocks.

***Eremopterix frontalis** (Blyth). The Black-crowned Finch-Lark.

Status not known. Uncommon. Noted only on one occasion in open grassland near Najafgarh, in February. Solitary.

Zosterops palpebrosa (Temm. & Schl.). The White-eye.

Resident. Fairly common in gardens and tree groves in cultivated areas. Small parties. Nest (with eggs): May (12th); seen feeding fledged young in August (1st).

Cinnyris asiaticus (Latham). The Purple Sunbird.

Resident. Common in gardens, trees in cultivation, etc. Solitary and pairs. Nest: in occupation in June.

Dryobates mahrattensis (Latham). The Yellow-fronted Pied Woodpecker.

Resident. Fairly common in woods, garden trees, and canal avenues. Solitary.

Brachypternus benghalensis (Linnaeus). The Golden-backed Woodpecker.

Resident. Common—trees in parks and gardens, woodland, canal avenues, etc. Solitary.

Iynx torquilla Linnaeus. The Wryneck.

Winter visitor. Fairly common. Occurs in gardens in New Delhi and around grass thickets in open country from August (8th) to April (23rd). Solitary and occasionally in pairs.

***Megalaima zeylanicus** (Gmelin). The Green Barbet.

Resident. Common in gardens with thick tree growth in New and Old Delhi; woodland, etc. This very obvious bird is not in Basil-Edwardes's list and has not been noted in Delhi before 1939. It appears, therefore, to be a new arrival in this area. Solitary.

Megalaima haemacephala (P. L. S. Muller). The Crimson-breasted Barbet.

Resident. Common in trees in parks and gardens and woodland in cultivated areas. Solitary and scattered small parties.

***Cuculus canorus** Linnaeus. The Cuckoo.

Passage migrant. Very uncommon. One observation in light woodland in April (27th). Solitary.

***Cuculus micropterus** Gould. The Indian Cuckoo.

Status not known. Uncommon. Noted in July (7th) in garden in New Delhi.

Hierococcyx varius (Vahl). The Common Hawk-Cuckoo.

Resident, but chiefly seen and heard from March to October in garden trees, and woodland. Common. Solitary and pairs.

Clamator jacobinus (Boddaert). The Pied Crested Cuckoo.

Rains visitor. Common from June (6th) to October (7th) in trees in gardens, parks and open country. Solitary.

Eudynamis scolopaceus (Linnaeus). The Koel.

Resident but chiefly evident during summer and rains. Commonly heard and seen from March to October in gardens, parks and woodland. Solitary and pairs.

Taccocua leschenaulti Lesson. The Sirkeer Cuckoo.

Presumably resident. Uncommon. Seen occasionally in thick cover in gardens in New Delhi and near Suraj Kund on a few occasions in the cold weather. Solitary.

Centropus sinensis (Stephen). The Common Crow-Pheasant.

Resident. Common. Occurs in garden thickets, scrub jungle and in rush and reed beds around jheels, rivers and canals. Solitary and small parties.

***Psittacula eupatria** (Linnaeus). The Large Indian Parakeet.

Chiefly spring visitor. Common in small parties and small flocks from March (12th) to May (3rd) in gardens and parks in Old Delhi less commonly in New Delhi. Very occasionally seen in open country in twos and threes during the rains and cold weather.

Psittacula krameri (Scopoli). The Rose-ringed Parakeet.

Resident. Very common in all types of wooded and cultivated country in small parties and small flocks.

Psittacala cyanocephala (Linnaeus). The Blossom-headed Parakeet.

Occasional rains and winter visitor. Uncommon. Seen in woodland in September and October and occasionally during the cold weather. Small parties.

Coracias benghalensis (Linnaeus). The Indian Roller.

Resident. Common in gardens and all types of open and cultivated country. Solitary.

Merops orientalis Latham. The Green Bee-eater.

Resident with marked local movements and increase of numbers during spring and autumn migrations. Common in gardens, cultivation and around jheels. Solitary and small parties.

Merops supercilIosus javanicus Horsfield. The Blue-tailed Bee-eater.

Rains visitor. Fairly common in small parties and flocks around jheels. Noted from July (21st) to October (29th).

Merops superciliiosus persicus Pallas. The Blue-cheeked Bee-eater.

No certain observations but appears to be a summer visitor to the south and south-west of New Delhi.

Ceryle rudis (Linnaeus). The Pied Kingfisher.

Resident. Common at jheels and rivers. Solitary and pairs. Nests: in occupation in November.

Alcedo atthis (Linnaeus). The Common Kingfisher.

Resident. Fairly common—rivers, canals and jheels. Solitary. According to Basil-Edwardes both *A. a. bengalensis* and *A. a. pallasii* occur in the Delhi area.

Halcyon smyrnensis (Linnaeus). The White-breasted Kingfisher.

Resident. Common. Occurs in gardens and cultivation as well as around rivers and jheels. Solitary.

***Anthracoceros malabaricus** (Gmelin). The Indian Pied Hornbill.

Occasional winter visitor. Noted on a few occasions in gardens in New Delhi from November (13th) to February (19th). Solitary and pairs.

Tockus birostris (Scopoli). The Common Grey Hornbill.

Resident. Common in gardens, parks and woodland in small parties.

Upupa epops epops Linnaeus. The European Hoopoe.

Winter visitor. Fairly common during the winter in cultivation and open country from September (30th). Solitary and scattered small parties.

Upupa epops orientalis Stuart Baker. The Indian Hoopoe.

Resident. Common in gardens, parks, grassland and cultivation. Solitary, pairs and small parties.

Micropus affinis (Gray). The Common Indian House Swift.

Resident. Common around towns, villages and old buildings in small flocks.

***Caprimulgus monticolus** Franklin. Franklin's Nightjar.

Presumably passage migrant. Uncommon. Noted in August and September (5th and 7th). Small parties.

Caprimulgus asiaticus Latham. The Common Indian Nightjar.

Resident. Fairly common around gardens in New Delhi, grassland and scrub country. Solitary and small parties.

Tyto alba (Scopoli). The Indian Barn Owl.

Status uncertain but presumably resident. Uncommon. Noted only in March and April in thick tree growth and around old buildings. Specimen captured alive in March (1940) by workmen repairing one of the Lodi tombs.

***Asio flammeus** (Pontoppidan). The Short-eared Owl.

Winter visitor. Not at all common. Occasionally observed when flushed out of long grass during the cold weather. Specimen shot in November (28th). Small parties.

***Ketupa zeylonensis** (Gmelin). The Brown Fish-Owl.

Status not definitely known but presumably resident. Uncommon. Noted in thorny tree of canal avenue in January (16th).

Bubo bengalensis (Franklin). The Rock Eagle-Owl.

Resident. Not at all common. Noted in ravines of eroded and broken ground. Solitary.

Bubo coromandus (Latham). The Dusky Eagle-Owl.

Resident. Fairly common in old established parks and gardens, in thick tree growth along canals and in riverain tracts. Solitary and pairs.

***Otus bakkamoena** Pennant. The Collared Scops Owl.

Status not known. Uncommon. Seen and heard from January (7th) to March (9th) in old established gardens with thick tree growth. Solitary.

Otus sunia (Hodgson). The Indian Scops Owl.

Status not known. Basil-Edwardes mentions specimen collected by him in March and by Cole in February. No subsequent records.

Athene brama (Temminck). The Spotted Owlet.

Resident. Common in gardens and tree groves in cultivation. Solitary and small parties at roosting and nesting sites.

***Pandion haliaetus** Linnaeus. The Osprey.

Winter visitor. Not at all common. Noted from August (8th) to February—usually seen 'hawking' over large jheels and rivers. Solitary.

Sarcogyps calvus (Scopoli). The King Vulture.

Resident. Fairly common in open country and soaring over towns. Usually solitary. Nests: In occupation January and February.

Gyps fulvus (Hablizl). The Indian Griffon Vulture.

Resident. Not at all common. Seen occasionally in open country. Solitary.

Pseudogyps bengalensis (Gmelin). The White-backed Vulture.

Resident. Common in towns and all types of country. Solitary, pairs and parties; soaring, at carcases, and at refuse dumps. Nests: Being built in October and in occupation to January.

Neophron percnopterus (Linnaeus). The Neophron.

Resident. Common in towns and villages. Solitary and pairs; large numbers at refuse dumps. *N. p. percnopterus, N. p. ginginianus* and intermediate birds probably occur.

***Falco peregrinus** Tunstall. The Peregrine Falcon.

Winter visitor. Uncommon. Noted only in riverain tracts in February (15th) and in April (7th). Solitary.

***Falco jugger** Gray. The Lugger Falcon.

Apparently winter visitor. Not at all common. Noted in wooded country and around New Delhi from September (22nd) to March (28th), solitary and pairs.

***Falco cherrug** Gray. The Saker Falcon.

Status not known. Uncommon. Specimen shot in November (21st).

Falco chicquera Daudin. The Red-headed Merlin.

Resident. Not at all common. Noted around rivers and large jheels from December to April and in June. Solitary and pairs.

Falco tinnunculus Linnaeus. The Kestrel.

Winter visitor. Fairly common in all types of open country from October (17th) to February. Solitary.

[**Aquila chrysaetos** (Linn.). The Golden Eagle.

Vagrant. A single bird on 31 December.] (? Eds.).

Aquila nipalensis Hodgson. The Steppe Eagle.

Winter visitor. Not at all common. Seen occasionally throughout the cold weather from October (10th), particularly at refuse dumps. Solitary.

***Aquila heliaca** Savigny. The Imperial Eagle.

Winter visitor. Not at all common. Seen occasionally at refuse dumps. Solitary.

Aquila rapax (Temminck). The Tawny Eagle.

Resident. Fairly common in open country and riverain tracts. Solitary and pairs.

Aquila pomarina Brehm. The Small Spotted Eagle.

Status not known. Basil-Edwardes refers to eggs taken by Bingham in May. No subsequent records.

Hieraëtus fasciatus (Vieillot). Bonelli's Eagle.

Presumably scarce resident. Basil-Edwardes refers to sight record by Cole in December and nest found by Hume at Tughluqabad. No subsequent records.

Ictinaëtus malayensis (Temm. & Laug.). The Black Eagle.

Presumably occasional winter visitor. Believed seen by Basil-Edwardes in winter of 1920-21 at Kingsway. Somewhat doubtfully observed at Okhla in March (3rd).

***Circaëtus ferox** (Gmelin). The Short-toed Eagle.

Presumably resident. Uncommon. Noted hovering with slow beating wings in the Hindan river area in October and January. Solitary.

***Haematornis cheela** (Latham). The Crested Serpent Eagle.

Presumably resident. Not at all common. Occasionally seen in country districts and around New Delhi. Solitary.

Butastur teesa (Franklin). The White-eyed Buzzard.

Resident. Fairly common in lightly wooded country and in cultivated areas. Solitary and pairs.

Haliaëtus leucoryphus (Pallas). Pallas's Fishing Eagle.

Resident. Fairly common on River Jumna,—usually seen resting on sandbanks; also occurs at large jheels. Solitary.

Icythyophaga ichthyaëtus (Horsfield). The Large Grey-headed Fishing Eagle.

Presumably resident. Not at all common. Noted in flight and on sandbanks of River Jumna at Okhla; and at large jheels, chiefly from October to April. Solitary.

***Haliastur indus** (Boddaert). The Brahminy Kite.

Principally rains visitor. Fairly common from July to October. Occasionally seen from December to March. Occurs around jheels and flooded country. Solitary.

Milvus migrans (Boddaert). The Common Pariah Kite.

Resident. Very common in towns, villages and all types of inhabited country. Gregarious. Nests: February and March.

***Milvus migrans lineatus** (Gray). The Black-eared Kite.

Winter visitor. Uncommon. Somewhat doubtfully observed in flight at Okhla on a few occasions in November, December and February (3rd). Solitary.

Elanus caeruleus (Desf.). The Black-winged Kite.

Resident. Not at all common. Occasionally seen in lightly wooded riverain tracts. Solitary and pairs.

Circus macrourus (S.G.Gmelin). The Pale Harrier.

Winter visitor. Not at all common. Observed in open rocky country in November (11th) and in January (8th) and February (17th). (Specimen collected, and seen on second occasion in November by Basil-Edwardes.)

***Circus cyaneus** (Linnaeus). The Hen Harrier.

Presumably winter visitor. Uncommon. Pair observed in open rocky country in September (22nd).

***Circus aeruginosus** (Linnaeus). The Marsh Harrier.

Winter visitor. Fairly common—noted from September (27th) to April (15th) around jheels and flooded country. Solitary.

Buteo rufinis (Cretzschmar). The Long-legged Buzzard.

Winter visitor. Fairly common from October to January in open country. Specimen obtained by Basil-Edwardes in February. Solitary.

Astur badius (Gmelin). The Shikra.

Resident. Fairly common—usually in lightly wooded country. Solitary.

[**Accipiter nisus** (Linn.). The Sparrow-Hawk.

Vagrant. Noted in December and January. Scarce. Identification not sure.]

***Pernis ptilorhynchus** (Temminck). The Crested Honey Buzzard.

Resident. Not at all common. Noted chiefly in light woodland in country districts and around New Delhi. Solitary and pairs.

Crocopus phoenicopterus (Latham). The Common Green Pigeon.

Resident, but more evident in hot weather than remainder of year. Not at all common. Pairs and small parties in leafy trees—particularly peepul.

Columba livia Gmelin. The Blue Rock Pigeon.

Resident. Very common in towns, villages, cultivated land and at water's edge of rivers in evening flights for drinking purposes. Solitary, pairs, small parties and small and large flocks.

***Streptopelia orientalis** (Latham). The Rufous Turtle Dove.

Passage migrant. Not at all common—noted north of Old Delhi in small parties in cultivation from March (4th) to April (16th). One doubtful observation in October (22nd).

Streptopelia chinensis (Scopoli). The Spotted Dove.

Resident. Not at all common and very patchily distributed. Noted occasionally,—particularly around irrigated fruit gardens. Pairs.

Streptopelia senegalensis (Linnaeus). The Little Brown Dove.

Resident. Very common in gardens and cultivation. Solitary and pairs. Nest (2 eggs): March.

Streptopelia decaocto (Frivalszky). The Indian Ring Dove.

Resident. Very common in gardens, cultivation and dry open country. Solitary, pairs and collects in small parties in late evenings. Nests (2 eggs each): March and October.

Oenopopelia tranquebarica (Hermann). The Red Turtle Dove.

Resident with increased numbers in the spring and hot weather. Fairly common. Occurs in cultivation and open country. Solitary, pairs and small flocks—the latter particularly evident during April.

Pterocles orientalis (Linnaeus). The Imperial Sandgrouse.

Winter visitor. Occasionally seen in January and February in small flocks in open sandy country usually when flighting for drinking purposes; occurs in recent shikar records for Delhi and district.

***Pterocles indicus** (Gmelin). The Painted Sandgrouse.

Presumably scarce resident. Noted near Suraj Kund (party of 6), June (30th).

Pterocles exustus Temminck. The Common Sandgrouse.

Presumably resident. Basil-Edwardes states 'common in suitable localities'. Noted in May (5th) and June (7th) in dry rocky country and occurs in recent cold weather shikar records for Delhi and district.

Pavo cristatus Linnaeus. The Common Peafowl.

Resident. Common in cultivation especially in the Kutb Minar and Eastern Jumna Canal areas. Usually in small parties.

Coturnix coturnix (Linnaeus). The Common Quail.

Winter visitor. Not often observed but probably fairly common. Occurs in small parties in crops, especially sugar cane.

***Coturnix coromandelicus** (Gmelin). The Rain Quail.

Rains visitor. Not at all common. Seen and heard from July (15th) to August (17th) in overgrown grassland. Pairs and scattered small parties.

Francolinus francolinus (Linnaeus). The Black Partridge.

Resident. Not at all common generally but fairly common east of the river Jumna. Occurs in cultivation and riverain areas. Solitary.

Francolinus pondicerianus (Gmelin). The Grey Partridge.

Resident. Common in cultivation and dry scrub jungle. Small parties.

***Turnix suscitator** Gmelin. The Common Bustard Quail.

Status not known. Uncommon. Specimen (female) captured alive on New Delhi golf course, September (2nd). Small party.

[**Turnix dussumieri** (Temm. & Laug.). The Little Button Quail.

Vagrant. Seen in May. Scarce. Identification doubtful.]

[**Hypotaenidia striata** (Linn.). The Blue-breasted Banded Rail.

Resident. Seen in March, April and May and suspected in other months. Small numbers about reed-fringed pools.]

***Porzana pusilla** (Pallas). Baillon's Crake.

Probably passage migrant. Uncommon. Noted only in October (10th) in thick grass on edge of jheel; and in March at Okhla. Solitary.

***Amaurornis phoenicurus** (Pennant). The White-breasted Waterhen.

Resident. Not at all common but occasionally seen in thick cover around jheels and tanks. Solitary and pairs.

Gallinula chloropus (Linnaeus). The Moorhen.

Resident. Fairly common around thick reed and rush cover on rivers and jheels. Solitary, pairs and small parties.

Fulica atra Linnaeus. The Common Coot.

Winter visitor. Noted only from October (15th) to January (7th) when it is fairly common on jheels in small parties and small flocks.

***Hydrophasianus chirurgus** (Scopoli). The Pheasant-tailed Jacana.

Resident. Fairly common on weedy jheels, particularly those planted with water-chestnut. Solitary, pairs, and small parties. Nests (each 4 eggs): July (18th), September (26th); young, August (6th), September (15th).

Rostratula benghalensis (Linnaeus). The Painted Snipe.

Chiefly passage migrant, with some residents. Not at all common. Seen in November (27th) and more commonly in April (7th to 18th) and also in June (19th) in herbage around jheels. Usually in pairs.

***Grus grus** (Linnaeus). The Common Crane.

Winter visitor. Not at all common but occasionally seen in small parties and flocks from October (16th) to April in flight over the Jumna and Hindan rivers, or in wheat fields of riverain areas. A score of Vs, skeins and straggling flocks (each 30-50 birds) seen flying south along river Jumna at sunset on October 16th.

***Grus leucogeranus** Pallas. The Great White Crane.

'Has been recorded as far east as Delhi'—*Fauna*, Vol. vi, p. 54.

Antigone antigone (Linnaeus). The Sarus Crane.

Resident. Common (especially east of the River Jumna) in crops and around jheels. Usually in pairs—occasionally in small parties.

***Anthropoides virgo** (Linnaeus). The Demoiselle Crane.

Winter visitor. Not at all common. Occurs in parties around the river Jumna from November to April (15th).

Choriotes nigriceps (Vigors). The Great Indian Bustard.

Basil-Edwardes says 'used to be found at Delhi some years ago'. No subsequent records.

Chlamydotis undulata (Gray). The Houbara.

Basil-Edwardes mentions sight record by friend. No subsequent records.

Burhinus oedicnemus (Linnaeus). The Stone Curlew.

Resident. Not at all common. Noted in riverain tracts and in gardens in New Delhi. Solitary, pairs and small parties.

***Esacus recurvirostris** (Cuvier). The Great Stone Plover.

Presumably resident. Not at all common. Observed in small flocks on sandbanks of river Jumna from November (26th) to April (19th) and in June (6th).

Cursorius coromandelicus (Gmelin). The Indian Courser.

Presumably scarce resident. Basil-Edwardes states seen in bare open country,—specimen obtained in February : Nests : end of March. No subsequent records.

***Glareola maldivarum** Forster. The Large Indian Pratincole.

Summer and rains visitor. Not at all common. Noted at Okhla on River Jumna and in open grassland from April (13th) to September (15th). Small flocks.

***Glareola lactea** Temminck. The Little Indian Pratincole.

Apparently spring and summer visitor. Fairly common. Noted on sandbanks of River Jumna, in February, March and in June (7th). Small and large flocks.

***Larus ichthyaetus** Pallas. The Great Black-headed Gull.

Passage migrant. Uncommon. Occasionally observed on the river Jumna from October (14th) to November (8th). Solitary.

***Larus ridibundus** Linnaeus. The Black-headed Gull.

Chiefly passage migrant. Not at all common. Seen at Okhla on River Jumna in October (20th), February (3rd), March (3rd) and April (1st)—small parties.

***Larus cachinnans** Pallas. The Yellow-legged Herring Gull.

Passage migrant. Uncommon. Noted only on River Jumna in October (26th). Small flocks.

Chlidonias hybrida (Pallas). The Whiskered Tern.

Status not known. Basil-Edwardes obtained specimen in December (28th). No subsequent records.

Sterna aurantia Gray. The Common River Tern.

Resident. Common on rivers and around jheels. Solitary, small parties and small and large flocks.

Sterna melanogaster Temminck. The Black-bellied Tern.

Resident. Fairly common. Usually seen in flight or resting on sandbanks of rivers and mudspits of jheels in small and large flocks.

***Sterna albifrons** Vroeg. The Little Tern.

Presumably resident. Uncommon. Noted on river Jumna at Okhla in June (28th) and October (2nd); in August (1st) at large jheel north of Old Delhi. Solitary.

Rhynchops albicollis Swainson. The Indian Skimmer.

Resident. Not at all common. Usually seen in flight, 'skimming', or resting on sandbanks of River Jumna—solitary, pairs and small parties. Nests (with eggs): May (11th).

***Leucopolius alexandrinus** (Linnaeus). The Kentish Plover.

Chiefly passage migrant. Not at all common. Noted on one occasion in December (18th) and more frequently at the end of April and in first fortnight of May on sandbanks of River Jumna. Small parties.

***Charadrius dubius** Scopoli. The Little Ringed Plover.

Winter visitor. Fairly common. Observed from July (21st) to April (15th) usually in small parties around jheels, rivers and in irrigated and flooded country. Some observations may refer to *C. d. jerdoni.*

***Vanellus vanellus** (Linnaeus). The Green Plover.

Winter visitor. Not at all common. Noted on banks of river Jumna and in irrigated fields in December and more commonly in January (to 25th). Small parties and small flocks.

***Chettusia gregaria** (Pallas). The Sociable Plover.

Winter visitor. Uncommon—seen on two occasions in ploughed fields near water in January (16th and 21st). Small flocks.

***Chettusia leucura** (Licht). The White-tailed Lapwing.

Winter visitor. Common around jheels and rivers in small parties from September (29th) to March (26th).

***Hoplopterus ventralis** Wagler. The Spur-winged Plover.

Resident. Fairly common on sandbanks of River Jumna. Solitary pairs, and small parties.

Lobivanellus indicus (Boddaert). The Red-wattled Lapwing.

Resident. Common in riverain tracts, around jheels and cultivation. Usually in pairs.

Lobipluvia malabarica (Boddaert). The Yellow-wattled Lapwing.

Resident. Not at all common. Noted from December to February in irrigated fields in open country. Three pairs nested on Central Vista, New Delhi in 1942,—3 eggs each, May (27th).

Himantopus himantopus (Linnaeus). The Black-winged Stilt.

Chiefly winter visitor with some residents. Fairly common from October (2nd) to April (12th) in small parties at jheels and tanks. Noted on several occasions in June on river Jumna.

***Recuvirostra avosetta** Linnaeus. The Avocet.

Occasional winter visitor. Very uncommon. Seen only on one occasion on River Jumna in December (13th). Small party.

Numenius arquata (Linnaeus). The Curlew.

Winter visitor. Not at all common. Noted occasionally from October (4th) to May (9th) on River Jumna and at large jheels. Solitary, pairs and small parties.

***Limosa limosa** (Linnaeus). The Black-tailed Godwit.

Occasional winter visitor. Uncommon. Somewhat doubtfully observed at jheels north of Old Delhi in January (14th) and February (18th). Small parties.

Tringa ocrophus Linnaeus. The Green Sandpiper.

Winter visitor. Common around jheels and tanks from September (2nd) to April (28th). Solitary and occasionally in twos and threes.

***Tringa stagnatalis** (Bechstein). The Marsh Sandpiper.

Winter visitor. Not at all common—occurs at jheels usually in small parties and small flocks, from August (14th) to April (13th).

Actitis hypoleucus (Linnaeus). The Common Sandpiper.

Winter visitor. Common. Seen from July (21st) to April (25th) around rivers, ponds, jheels and tanks. Solitary and occasionally in twos and threes.

Tringa glareola Linnaeus. The Wood Sandpiper.

Winter visitor. Fairly common. Seen from October (4th) to May (7th) around jheels, canal banks and river banks. Usually in small flocks.

***Tringa totanus** (Linnaeus). The Redshank.

Winter visitor. Common on river banks and at jheels from October (4th) to April (13th) in small parties and small flocks.

Tringa erythropus (Pallas). The Dusky Redshank.

Winter visitor. Not at all common. Noted occasionally from December (8th) to April (30th) on river banks and at jheels. Solitary and small parties. Solitary bird seen in June (18th).

***Tringa nebularia** (Gunner). The Greenshank.

Winter visitor. Fairly common from September (7th) to April (28th) at jheels. Usually solitary.

***Philomachus pugnax** (Linnaeus). The Ruff and Reeve.

Winter visitor and passage migrant. Uncommon. Specimens obtained at jheel south of Delhi in November (7th). Seen also at Okhla in March (28th), and April (3rd). Small parties.

***Calidris minuta** (Leisler). The Little Stint.

Winter visitor. Fairly common from October (24th) to May (7th) in small parties around jheels, and on river banks.

Calidris temminckii (Leisler). Temminck's Stint.

Winter visitor. Fairly common. Noted from January (7th) to March (30th) at jheels. Solitary and small parties.

***Erolia alpina** (Linnaeus). The Dunlin.

Winter visitor and passage migrant. Not at all common. Seen on sandbanks of River Jumna in November (19th), January (28th) and in May (20th). Small parties.

Capella gallinago (Linnaeus). The Common Snipe.

Winter visitor. Common from September (22nd) to April (7th) in thick herbage around jheels. Solitary and small parties.

Lymnocryptes minimus Brunnich. The Jack Snipe.

Winter visitor. Not at all common. Seen only around jheels in October (24th) and January. Solitary.

Pelecanus sp. The Pelican.

Species not known. Apparently summer and rains visitor. Uncommon. Noted on River Jumna as follows;—solitary in May (17th); pair in June (6th); small party (4) in July (11th), small party (10) in October (21st).

* **Phalacrocorax carbo** (Linnaeus). The Common Cormorant.

Presumably winter visitor. Fairly common on Rivers Jumna and Hindan from October to March; solitary and small parties. Large flock of 100-150 seen resting on sandbank of River Jumna in March (5th).

Phalacrocorax niger (Vieillot). The Little Cormorant.

Resident. Common on rivers, canals and jheels. Solitary.

Anhinga melanogaster Pennant. The Indian Darter.

Resident. Common on rivers, canals and large jheels. Solitary and small parties.

Platalea leucorodia Linnaeus. The Spoonbill.

Chiefly winter visitor, with some residents. Fairly common. Noted from October (2nd) to March (5th) and in June (6th) in small and large flocks around jheels.

* **Threskiornis melanocephalus** (Latham). The White Ibis.

Chiefly winter visitor, with some residents. Fairly common from October (4th) to January (21st) at large jheels and near canals and rivers. Noted also in June (14th). Small parties and small and large flocks.

Pseudibis papillosus (Temminck). The Black Ibis.

Resident. Not at all common. Noted at jheels and in irrigated fields in December (19th), April (7th) and (14th) and in June (7th). Pairs and small parties.

* **Plegadis falcinellus** (Linnaeus). The Glossy Ibis.

Status unknown. Very uncommon. Reported observed on one occasion near Ghaziabad in December (5th).

* **Ciconia ciconia** (Linnaeus). The White Stork.

Winter visitor. Not at all common. Seen on river Jumna at Okhla, at large jheels and in flooded grassland from January (14th) to February (6th). Small parties.

* **Ciconia nigra** (Linnaeus). The Black Stork.

Presumably occasional passage migrant. Very uncommon. Noted on one occasion at Suraj Kund in March (6th). Solitary.

Dissoura episcopus (Boddaert). The White-necked Stork.

Resident. Common around jheels, in riverain areas and irrigated fields. Solitary, small parties and small flocks.

Xenorhynchus asiaticus (Latham). The Black-necked Stork.

Resident. Common on river banks, around jheels and in flooded country. Solitary, pairs and small parties—latter usually consisting of adult and young birds. Seen carrying sticks to nest in August (26th).

* **Leptoptilos dubius** (Gmelin). The Adjutant.

Presumably winter visitor. Uncommon. Noted only at refuse tips in April. Solitary.

* **Ibis leucocephalus** (Pennant). The Painted Stork.

Resident. Common on river and canal banks, around jheels and in irrigated fields. Solitary, small parties, small and large flocks.

* **Anastomous oscitans** (Boddaert). The Open-Bill.

Resident. Fairly common at small jheels and in irrigated and flooded cultivated areas particularly north and east of Delhi. Solitary and pairs,—occasionally small parties.

***Ardea purpurea** Linnaeus. The Purple Heron.

Resident. Not at all common but occasionally seen in rush and reed beds around rivers and jheels. Solitary.

Ardea cinerea Linnaeus. The Common Grey Heron.

Resident. Common on river banks and at jheels and village tanks. Solitary and small parties.

* **Egretta alba** (Linnaeus). The Large Egret.

Resident. Common—river banks, jheels and tanks. Usually solitary.

Egretta intermedia (Wagler). The Smaller Egret.

Resident, but noted at jheels chiefly from November to January. Recorded in June (14th and 25th). Solitary. Basil-Edwardes refers to eggs taken by Bingham July—August.

* **Egretta garzetta** (Linnaeus). The Little Egret.

Resident. Very common—river banks, tanks, ponds and irrigated fields. Solitary, small parties and small flocks.

Bulbulcus ibis (Linnaeus). The Cattle Egret.

Resident. Common in pastures and grassland in small parties and small flocks.

Aredeola grayii (Sykes). The Pond Heron.

Resident. Very common around rivers, streams, jheels, tanks, ponds and irrigated fields. Solitary and small parties.

Butorides striatus (Linnaeus). The Little Green Heron.

Resident. Not at all common. Noted occasionally on banks of river Jumna and at jheels in May (16th), September (27th) and during the cold weather. Solitary.

Nycticorax nycticorax (Linnaeus). The Night Heron.

Presumably resident, but chiefly seen from July to January at Okhla on the River Jumna. Solitary, small parties and small flocks at roosting sites.

* **Ixobrychus cinnamomeus** (Gmelin). The Chestnut Bittern.

Status not known. Uncommon. Observed on one occasion at tank near Ghaziabad in January (10th). Solitary.

* **Phoenicopterus ruber** Pallas. The Flamingo.

Winter visitor. Uncommon. Observed in flight on a few occasions at Okhla following the course of the River Jumna; in October (29th)—three; March (22nd)—two; April (2nd)—five. Flock of about 100 noted on jheel at Hasanpur near Ghaziabad in December 1939.

* **Phoeniconaias minor** (Geoffrey). The Lesser Flamingo.

'Has been recorded . . . . near Delhi',—*Fauna,* Vol. vi, p. 376.

Sarkidiornis melanotos (Pennant). The Nukta.

Resident. Not at all common. Recorded in March (21st), June (15th and 30th) and occasionally during the cold weather. Solitary, pairs and small flocks.

* **Nettapus coromandelianus** (Gmelin). The Cotton Teal.

Presumably resident. Uncommon. Occurs in recent shikar records for Delhi and district.

Anser anser (Linnaeus). The Grey Lag Goose.

Winter visitor. Uncommon. Occurs in recent cold weather shikar records for Delhi and district.

* **Anser albifrons** (Scopoli). The White-fronted Goose.

Winter visitor. Uncommon. Specimen shot in November (11th) believed to be of this species. Three seen on sandbank of River Jumna in February (4th).

* **Anser indicus** (Latham). The Bar-headed Goose.

Winter visitor. Fairly common on River Jumna from November (3rd) to March (17th). Small parties and small flocks.

Dendrocygna javanica (Horsfield). The Lesser Whistling-Teal.

Status not known. Basil-Edwardes refers to nest found by Bingham in August. No subsequent records.

* **Tadorna tadorna** (Linnaeus). The Sheldrake.

Occasional winter visitor. Uncommon. Specimen shot at jheel in November (13th). Party of six seen on one occasion at Dankaur jheel in January (24th).

Casarca ferruginea (Pallas). The Ruddy Sheldrake.

Winter visitor. Fairly common on rivers and at large jheels. Noted from October (20th) to April (3rd). Small parties and small flocks.

Anas platyrhyncha Linnaeus. The Mallard.

Winter visitor. Not at all common. Noted only on Hindan river in February. Small flocks.

* **Anas poecilorhyncha** Forster. The Spotbill.

Presumably resident. Noted by Basil-Edwardes as 'common'. Occurs in recent shikar records for Delhi and district.

* **Anas falcata** (Georgi). The Crested Teal.

Occasional winter visitor. Uncommon. Specimen shot north of Delhi in February (19th).

Anas strepera Linnaeus. The Gadwall.

Winter visitor. Noted by Basil-Edwardes as 'very common'. Occurs in recent cold weather shikar records for Delhi and district.

Anas penelope Linnaeus. The Wigeon.

Winter visitor. Noted by Basil-Edwardes as 'not uncommon'. Occurs in recent cold weather shikar records for Delhi and district. Small flocks seen on River Jumna at Okhla in February (3rd).

Anas crecca Linnaeus. The Common Teal.

Winter visitor. Common on jheels and canals in large and small flocks. Noted from September (2nd) to April (13th).

* **Nettion formosum** (Georgi). The Baikal Teal.

'In 1879 Chill obtained a male near Delhi',—*Fauna*, Vol. vi, p. 435. (A solitary male observed by R. S. Symons on Jumna sandbank, below Humayun's tomb, 12-5-1947—Eds.)

Anas acuta Linnaeus. The Pintail.

Winter visitor. Fairly common on rivers and large jheels in small flocks. Noted from October (20th) to March (31st).

* **Anas querquedula** Linnaeus. The Blue-winged Teal.

Winter visitor. Not at all common. Seen on large jheels in January (3rd) and in April (9th). Small parties.

Spatula clypeata (Linnaeus). The Shoveller.

Winter visitor. Fairly common. Occurs in recent cold weather shikar records for Delhi and district. Solitary male noted on River Jumna in May (2nd).

Netta rufina Pallas. The Red-crested Pochard.

Winter visitor. Noted by Basil-Edwardes as 'not uncommon'. Seen only on one occasion on Hindan river in February (22nd).

Aythya ferina (Linnaeus). The Common Pochard.

Winter visitor. Noted by Basil-Edwardes as 'common'. Occurs in recent cold weather shikār records for Delhi and district.

Aythya rufa (Linnaeus). The White-eyed Pochard.

Winter visitor. Noted by Basil-Edwardes as 'common'. Seen at Suraj Kund in March (21st).

Aythya fuligula (Linnaeus). The Tufted Pochard.

Winter visitor. Noted by Basil-Edwardes as 'believed not uncommon'. One record in early April (solitary).

* **Erismatura leucocephala** (Scopoli). The Stiff-tailed Duck.

'In 1882 Chill obtained three . . . near Delhi',—*Fauna*, Vol. vi, p. 463.

Mergellus albellus (Linnaeus). The Smew.

Status not known. Basil-Edwardes refers to specimen shot at Delhi. No subsequent records.

* **Podiceps cristatus** (Linnaeus). The Great Crested Grebe.

Status not known. Very uncommon. Seen only on one occasion on River Jumna in January (15th). Solitary.

* **Podiceps ruficollis** (Pallas). The Little Grebe.

Resident. Common on large jheels and tanks. Solitary, pairs and small parties. Nests: August (12th), 4 eggs.

NOTES ON THE BIRDS OF THE GYANTSE ROAD, SOUTHERN TIBET, MAY 1946

BY

P. I. R. MACLAREN

(With a map)

The Hram Tso and Kala Tso lakes of Tibet lie at an altitude of over 14,500 ft. on the main treaty road to Lhasa. Their ornithology was well described by Frank Ludlow (1927), who was able to study the breeding species while on his way to and from Gyantse, fifty miles north of the lakes. In 1946 leave could only be taken during May, so that it was not possible for the trip described to coincide with the main nesting season; Ludlow's breeding and nidification data are therefore little amplified.

It was however interesting to find that the Kala Tso (14,600 ft), into which the Hram Tso empties, was approximately one-fifth of its size in 1903-1904 when the quarter-inch survey was made, and apparently also of its size when Ludlow knew it. The lake has no outlet and its watershed is small compared to that of the Hram Tso, which receives the drainage of the northern and western slopes of the Chomolarhi range. According to local information the Kala Tso had dried out completely three times since about 1934, always just before the spring thaw in April, and its present (mid-May) depth was estimated as nowhere more than three feet. The big fish for which the lake had been famous were dead, and the salinity of the water increased.

Little aquatic life was found in the lake except at the south-eastern corner in the vicinity of the inflow from the Hram Tso, and at the western end, where a smaller stream enters. It was there that all the duck and most of the Ruddy Sheldrake seen on the lake had congregated. Even fewer of the breeding birds which Ludlow noted as common on the Hram Tso and occurring on the Kala Tso were present on the latter lake, their absence probably being correlated with the lack of food and the shallower water. For example, the colonies of Great Crested Grebes which he describes were no longer in evidence.

On the other hand, numbers of waders (a large proportion recorded only as sparse by Ludlow, Bailey, Kinnear and others) were seen on the brackish pools and mud-flats of the eastern part of the Kala Tso, and less so around the Hram Tso. Though doubtless the majority were stragglers from the spring migration, snipe and avocet certainly gave the impression of being about, to breed.

Marshes lie on the eastern and southern borders of the Hram Tso, stretching in the latter direction some miles from the water. The grassy islands upon which Bailey (1909 a) found large numbers of Bar-headed Geese nesting occur only along the eastern shore. Mud-flats such as those of the Kala Tso are negligible in size, due to the unchanging water-level, but the narrow muddy strand along the northern, western, and south-western lake-edge provides a considerable feeding area for wading birds. Very conspicuous indeed were the vast hordes of black mosquito-like insects *Chironomidae* which were hatching in countless myriads in the Hram marshes (and to a lesser extent in the south-eastern corner of the Kala Tso) and were blown across the water to form banks inches deep. For a distance of two hundred yards from the lake these insects swarmed in every depression and behind every stone. They stained the smaller pools with their decomposing bodies, while those still alive were stirred up in clouds by passing men and animals. Redshank, stint and avocet were gorging on this feast, though they were only seen to pick up such insects as were floating in the water. Gulls, terns and geese were apparently not attracted.

In his first paper (1927) Ludlow includes also observations of the birds of the Chumbi valley, that area of Southern Tibet which lies between Sikkim and Bhutan. This area has however been considered separately, for it differs in many respects from similar wooded parts of Sikkim, and also a very natural border-line between it and the so-called Tibetan plateau exists at the last trees at about 14,000 ft. above Dotag, just before the bare Phari plain is reached. Accordingly these notes commence there and concern the route up to and including the lakes.

Ludlow's recent paper (1937) is a fuller account of birds seen and collected in the Chumbi valley and more extensively in parts of Tibet and Bhutan further east. As the references he quotes in his first paper are not complete, and some of those of N. B. Kinnear (1922) are misprinted, as full a list as can be traced is given below.

The Political Officer in Sikkim could not permit any shooting, so that the collection of birds about which doubt still exists was unfortunately impossible.

Corvus corax tibetanus. Tibetan Raven.

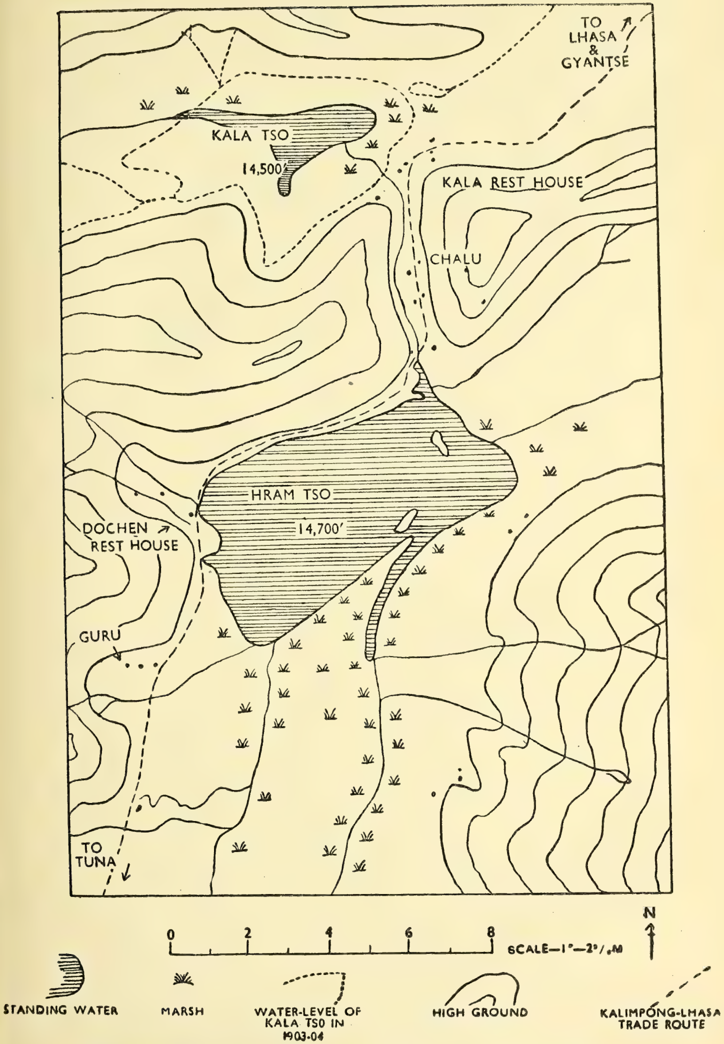
Abundant from Phari to Kala, especially near the villages. An empty nest at Kala from which young may have flown contained several of the reeds wrapped with wool with which the Tibetans adorn their 'mendongs'.

Pyrrhocorax pyrrhocorax himalayensis. Eastern Red-billed Chough.

Very abundant from the Jelepla up to Kala, mixing with the Jungle Crows in the Chumbi valley, and replacing them thereafter as scavengers. They formed large flocks for feeding purposes, as on the grassier parts around the lakes, but at the same time were nesting. No Yellow-billed Choughs (*P. graculus forsythi*) were seen definitely, although Ludlow thought it might breed in the Chumbi valley. Kinnear recorded the species from higher altitudes than were visited on this occasion.

Podoces humilis. Hume's Ground Chough.

Always in pairs, preferring the sandier hillsides, upon which they were widespread; but also seen on the Phari plain and near the marshes around the lakes. On several occasions they were observed to pick up yak's wool for nesting material.


TO LHASA & GYANTSE
KALA TSO
14,500′
KALA REST HOUSE
CHALU
HRAM TSO
14,700′
DOCHEN REST HOUSE
GURU
TO TUNA
0
2
4
6
8
SCALE—1"—2½M
N
STANDING WATER
MARSH
WATER-LEVEL OF KALA TSO IN 1903-04
HIGH GROUND
KALIMPONG-LHASA TRADE ROUTE

Diagrammatic sketch of the vicinity of the Hram Tso and Kala, Tso, Southern Tibet.

The traveller expecting to find a chough-like bird will be disappointed, for this species is much the size of a snowfinch, and bears superficial resemblance to a wheatear.

Oenanthe deserti oreophils. Tibetan Desert Chat.

Sparse, only being seen twice, between Tuna and Dochen, and at Kala, after mid-May, though according to Ludlow they arrive in April. Hingston however considers the species a late breeder.

Phoenicurus hodgsoni. Chestnut-breasted Redstart.

Phoenicurus rufiventris. Eastern Indian Redstart.

Common birds in all the rocky places up to 16,000 feet. These species are so similar that I am doubtful of their relative status.

Ph. erythrogaster grandis. Afghan Redstart.

Only seen in one place, from 15,000 feet to 17,000 feet in the valley west of Dochen. Ludlow considered that it bred above 16,000 feet, as it was absent from Gyantse in summer.

Prunella rubeculoides. Robin Hedge-Sparrow.

Common from Tunar to Kala, showing a preference for the close-cut marshy tussocks near villages. Frequently flew on to walls and houses, but not seen to carry nesting material. Territorial and courtship display was frequently noticed. A few birds were met with on the northward journey after first leaving the Tromo Chu on 7 May, and were also present on 18 May. Ludlow, in describing the species as very common north of the Tang La, may have inferred that it was sparse elsewhere.

Carpodacus rubicilloides lapersonnei Tibetan Rosefinch.

An isolated male near Dochen on 16 May.

Passer montanus tibetanus. Tibetan Tree-sparrow.

Abundant at every little village and that up to Nala.

Montifringilla nivalis adamsi. Tibetan Snowfinch.

This Snowfinch was only seen at 2 places, both near cliffs; at Guru, and in the valley between the Hram Tso and Kala Tso. The male's threat display includes a bob and fanning of the tail. The large white bar in the wings is even more noticeable than the white outer tail-feathers mentioned in the *Fauna*. Ludlow found it abundant at all elevations between Phari and Gyantse.

Montifringilla taczanowskii. Ashy-necked Snowfinch.

Seen only near the Tang La on 17 May, where males were fighting, and south of Phari on 18 May, where pairs seemed to have established territory. I do not think this species had arrived in this area on 7 and 8 May.

Montifringilla ruficollis. Red-necked Snowfinch.

This species was carrying nesting material near the Tang La on 17 May, and widespread in pairs south of Phari on 18 May. I might have confused this snowfinch with the next on the northward journey, but nevertheless I do not think it had arrived on 7 and 8 May.

Montifringilla blandfordi. Black-throated Snowfinch.

This species was abundant in flocks on the Phari plain on 7 and 8 May, but on the return journey, 17 May, only a few were seen near Shubra below the Tang La. Ludlow thought it a resident at high elevations.

Fringilauda brandti haematopygia. Tibetan Mountain-Finch.

Frequented fields near villages, still in flocks. A few near Phari, and flocks of several hundred west of Dochen.

Ptyonoprogne rupestris. Crag Martin.

Hurried glimpses were obtained near the Hram Tso of what was probably this species, which Ludlow notes as breeding in June and July, and Walton as common in Southern Tibet.

Motacilla lugubris alboides. Hodgson's Pied Wagtail.

Only seen once, near Dochen on 9 May. It may arrive later, as Ludlow describes it as breeding commonly in May and June.

Motacills citreola calcarata. Hodgson's Yellow-headed Wagtail.

Widespread in wet places, though never abundant as recorded by Ludlow. First met with immediately after leaving the Tromo Chu.

Otocorys alpestris elwesi. Elwes's Horned Lark.

Ludlow says of this species that it breeds near the Hram Tso. I found it one of the most abundant and widespread birds after leaving the Tromo Chu; on the open Tuna plain, near the marshes, and on the hills up to 16,500 feet. They were mostly in pairs and small parties, though on 11 May a big flock of about 300 was noted in the rocky valley west of Dochen. It was however not seen south of Phari on 18 May, and so the birds previously present there may have moved on.

Melanocorypha maxima. Long-billed Calandra Lark.

Sparse in the marshes south of the Hram Tso and those south-east of the Kala Tso though Ludlow only records it for the first locality. Song flight was noticed on 12 May. I think this species must be a strong mimic, as I heard calls of Redshank, Greenshank and Curlew, when no other bird was in sight. Nor did I even see Curlew.

Alauda arvensis inopinata. Tibetan Skylark.

A few pairs were seen near Kala bungalow, and on 18 May it was abundant between Kamparab and the Tromo Chu among the hillside ling, singing lustily. A nest with 1 egg was found on that date. If they were present on 7 May they certainly were not singing, for I observed none on the northward journey. Ludlow found it abundant near Gyantse.

Calandrella acutirostris. Hume's Short-toed Lark.

This lark was first met with on the Phari plain after leaving the Tromo Chu, and thereafter was extremely widespread on the barest plain, in cultivation, and on rocky hillsides. They frequented especially the mule route across the Tuna plain and only bothered to run a few paces out of the way of animals. There was no evidence of their having commenced nesting, although they were definitely paired.

A specimen was picked up and a skin made and identified.

Upopa epops saturata. Tibetan Hoopoe.

A few were seen at Phari and Tuna, and probably had commenced nesting.

Gyps himalayensis. Himalayan Griffon Vulture.

Frequently seen soaring between the Tromo Chu and Kala, but no evidence of breeding was obtained.

Gypaëtus barbatus. Himalayan Lämmergeier.

Sparse throughout, but no trace of its breeding. According to Ludlow this occurs in February.

Falco cherrug. Saker Falcon.

Quick views were obtained of falcons near the lakes on two occasions, probably this species. Ludlow records the Saker as occurring in autumn and winter.

Cerchneis tinnunculus subsp. Kestrel.

Occasionally seen near Hram Tso. Considerable doubt exists as to the species and sub-species of Kestrel which occur in this area.

Haliaëtus leucoryphus. Pallas's Fishing Eagle.

Common around both lakes, but not seen fishing. Its call reminded me of a hoarse pekinese barking, and is very similar to the call of the White-tailed Sea Eagle (*H. albicillus*).

Milvus migrans lineatus. Large Indian Kite.

Sparse throughout. No kites were seen that might have been the sub-species *govinda*.

Buteo burmanicus. Japanese Desert Buzzard.

A buzzard was seen several times around Phari and the lakes which I think I identified correctly as this species. Ludlow was unsure which of the buzzards bred near Gyantse, while Bailey (1909 b) recorded a nest of the Himalayan Rough-legged Buzzard (*Archibuteo hemiptilus*). In a later paper (1911) he cancelled the record as insufficiently proven.

Columba rupestris turkestanica. Turkestan Blue Hill-Pigeon.

From the Tang La to Kala this confiding pigeon was often seen near houses and in fields. Though semi-domesticated, I think many of the birds nest away from houses, as pairs were met with in most rocky and sandy cliffs.

Syrrhaptes tibetanus. Tibetan Sandgrouse.

A single bird flying eastwards over the Tuna plain on 17 May was probably of this species. None were seen near the lakes, although Ludlow mentions their occurring there. He may have meant only in winter, as he says the bird is found above 14,000 feet in summer.

Tetraogallus tibetanus centralis. Snowcock.

Two pairs seen, one by Guru, and one west of Dochen.

Grus nigricollis. Black-necked Crane.

Pairs were scattered all over the marsh south and west of the Hram Tso, but only pair east of the Kala Tso. Near the former lake it seemed that each pair had its territory, but had not started to breed.

Larus brunnicephalus Brown-headed Gull.

This gull was common all around the Hram Tso and its marshes, especially on the grassy islands with the terns. A few were seen flying up the river leading to the Kala Tso but none were observed on the lake itself. Ludlow found it common on both lakes.

Sterna hirundo tibetana. Tibetan Tern.

Common around both lakes and seen foraging over all the marshes and side streams. A considerable number were sitting on the northernmost grassy island on the eastern side of the Hram Tso, but shewed no sign of having begun to breed.

Cirripedesmus mongolus atrifrons. Pamirs Lesser Sand-Plover.

Only seen on the shore near Dochen on the Hram Tso, but very abundant on the salty islands and mud-flats of the Kala Tso, where territorial behaviour was noticed. In addition a pair was seen on a 17,000 feet ridge west of Dochen and pairs were quite numerous 3 to 7 miles south-west of Tuna on the bare plain, where one pair was observed chasing Short-toed Larks as though from its territory. Ludlow also found this species on stony plains miles from the lakes.

Recurvirostra a. avocetta. Avocet.

There was a surprising number of these birds on both lakes, though Ludlow only quotes Bailey's record of occurrences in autumn. At the western end of the Hram Tso were 2, and at the north-eastern end a flock of 55, while on the mud-flats of Kala Tso a flock of over 25 was present. There was no obvious pairing off, but occasionally a bird would fly round calling loudly, a note I have never heard from the birds in their winter-quarters.

Glottis nebularia. Greenshank.

On 13 May 1 was on the Kala Tso, and 2 days later 2. Ludlow was uncertain whether it bred and Bailey (1911) records it only in autumn.

Tringa totanus terrignotae. Eastern Redshank.

Very abundant around the Hram Tso, feeding in flocks. Pairs had taken up territory in the marsh south of the lake, and the breeding call was frequently heard. They did not exhibit sufficient alarm to indicate their having nests. It was sparse at the eastern end of the Kala Tso, where only feeding birds were seen.

Eriola temminckii. Temminck's Stint.

This was very abundant around the shores of both lakes in flocks of 10 to 400 birds. At least a thousand were feeding on the mud-flats at the eastern end of the Kala Tso. On only one occasion were 2 seen alone in circumstances pointing to the likelihood of their being about to breed, in the marsh south of Hram Tso on 10 May.

The skin of a bird picked up was identified.

Ludlow says they pass on spring migration in April, but does not mention in what numbers. Wollaston collected birds near Everest in September.

Erolia testacea. Curlew Sandpiper.

One at Kala Tso on 13 May among a flock of Temminck's Stints. A clear view was obtained through a telescope.

Erolia a. alpina. Dunlin.

Three with the Curlew Sandpiper, one being in full summer plumage.

Lobipes lobatus. Red-necked Phalerope.

Two closely observed by telescope among the Temminck's Stints on the Kala mud-flats on 13 May, 1 male and 1 female.

Capella g. gallinago. Fantail Snipe.

Capella stenura. Paintail Snipe.

Snipe were common in the marsh south of the Hram Tso. No drumming was heard, but only the *chip-chip* breeding note occasionally. They were sufficiently distributed to suggest their having taken up territory. I am uncertain which species was present; possibly the former, as F. Finn in 'How to know the Indian Waders' describes the breeding note of the Fantail as *tchik-tchack* and that of the Pintail as *tiric-tiric*. Ludlow records the former as occurring at Gyantse on both migrations and the latter in autumn only. He does not mention the summer status of either.

Anser indicus. Bar-headed Goose.

Abundant on the Hram Tso and its surrounding marshes, but none seen on the Kala Tso, the absence perhaps being explained by the desiccation and salinity of the lake.

A nest with 5 fresh eggs was found deep in the marsh south of the Hram Tso on 10 May, but the majority had not yet begun breeding, as the birds resting around the lake and on the water were still paired. Bailey (1900 a) had found nesting in full swing on 2 June 1902, on the eastern side of the lake. I inspected the northernmost island through a telescope and saw only a few pairs standing around.

On 16 May a pair was noticed flying to and fro and later perching in the 200 feet cliffs south of Dochen, and 6 pairs were sitting on a rocky cliff about a 100 feet high and difficult of access near Guru. When disturbed they flew around several times calling loudly. Neither Ludlow nor Bailey mentioned the use of cliffs as nesting sites by this species, and the local men I questioned would not admit to knowledge of any such habit. They stated that no eggs had been collected for food for years, but I found this hard to believe.

Casarca ferruginea. Ruddy Sheldrake.

Extremely abundant around the lakes. They appeared to have just begun nesting, as nearly all the birds seen on the marshes and lakes were still in pairs, and there was a constant procession of pairs to the neighbouring cliffs, near which they were flying to and fro, occasionally settling. They were obviously still prospecting for nesting sites. Though the hills around the lake basins are very eroded there are sufficient cliffs, and upon only one occasion, at Chalu, were birds seen to perch on the roofs of houses, in which according to Ludlow they probably nest frequently.

Tadorna tadorna. Common Sheldrake.

A flock of 15 at the western end of the Kala Tso on 14 May. Ludlow saw this species only 2 or 3 times in March.

Anas p. platyrhyncha. Mallard.

One on Hram marshes on 10 May. Ludlow thought it might breed.

Mareca penelope. Wigeon.

Two on Hram marsh on 10 May and one on the Kala Tso 14 May. Ludlow considered this duck an uncommon passage migrant.

Nettion crecca. Common Teal.

Three on Hram marsh on 10 May. Ludlow recorded it as a passage migrant and winterer.

Netta rufina. Red-crested Pochard.

Two females on the Kala Tso with the Sheldrakes on 14 May. Ludlow saw this species only 2 or 3 times in March.

Nyroca r. rufa White-eyed Pochard.

Small flocks on the Hram marsh on 10 May. Ludlow was certain it stayed to breed.

Mergus merganser orientalis. Eastern Goosander.

Three were flying down the river near Shobra on 8 May.

Podiceps c. cristatus. Great Crested Grebe.

Not more than 5 were seen near floating masses of weed within half a mile of the northern shore of the Hram Tso. These may have been nesting birds. Ludlow describes several colonies on the Kala Tso including one of several pairs near the inflow by Kala village. The lake-ridge was then about half a mile from the dak-bungalow; it is now quite 3 times that distance. There were definitely no grebes on the lake in 1946.

The following species noted by Ludlow as common or fairly common were not seen. With the possible exception of the first, he considered that they bred in the Phari—Gyantse area.

Troglodytes troglodytes tibetanus. Tibetan Wren.

Acanthis flavirostris rufostrigata. Tibetan Twite.

Riparia riparia ijimae. Eastern Sand-Martin.

Athene noctua ludlowi. Tibetan Owlet.

Perdix h. hodgsoniae. Tibetan Partridge.

Lerwa lerwa. Snow Partridge.

Fulica atra. Coot.

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AB-ISTADEH, A BREEDING PLACE OF THE FLAMINGO [*PHOENICOPTERUS RUBER ROSEUS* (PALLAS)] IN AFGHANISTAN

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(With two maps and a plate)

Some of my studies last year revealed that Ab-istadeh, if not at present, has once been a breeding place of flamingoes. Since then I have been keen on visiting the place in order to study the present conditions of Ab-istadeh in regard to these birds. The idea was further animated by Mr. Sálim Ali urging me to visit the place myself. At last I proposed a tour to Ab-istadeh with some students of the faculty, and I am very thankful to Dr. Abdul

Majeed Khan, Vice-Chancellor of Kabul University, for granting the necessary funds. The time for the tour was, unfortunately, not proper as it was late in spring and the month of Ramzan was also to begin in a few days. According to programme we were to stay there for twenty-four hours only and I am sorry, in such a short visit, I could not collect enough material or other data regarding the habits or breeding of the birds, but the following notes, though brief and incomplete throw sufficient light on the main features of Ab-istadeh and breeding of flamingoes over there.

Early morning on 16th July, I with Mr. A. S. Shalizi, a colleague of mine, and twenty students left for Ab-istadeh. I have already mentioned (1) its distance from Ghazni as about forty-four miles, but as there is no direct road from Ghazni to that place we had to take a longer route, going first to Mukar, sixty-three miles south-west of Ghazni (or a hundred and forty-eight miles from Kabul) and then coming south-east to Ab-istadeh. A small road, a furlong or two beyond Mukar, separates from this main road to Kanadhar and goes south-east to Karrauddin, a village near Ab-istadeh and about twenty-five miles from Mukar. It passes through an open plain generally waste and barren on account of the scarcity of water. Wherever there is a canal or a *karez* some cultivation is carried on and the wheat crops were now standing ripe and ready for reaping. Some very common trees of the country like willow, poplar and mulberry are grown here and there, mostly in rows along the canals, but no plane tree is found on this side of the Ab-istadeh basin as has been mentioned by Elphinstone (2). In the surrounding wastes, the dominant plants are the low shrubs of camel-thorn (*Alhagi camelorum*) called locally *Shuttar-khar*. Among them are dispersed low shrubs of *Paganum harmala*, called locally *Spund*. Both are common shrubs of dry wastes; the seeds of the latter are sprinkled over fire and supposed to purify the air. Here and there some patches of *Artemisia* sp. called locally *Tirkh* are also met with. A few flocks of sparrows were seen flying over the cornfields, some Crested Larks (*Galerida cristata*) hopping along roadsides and among low shrubs, and a few Scavenger Vultures (*Neophron percnopterus*) sitting here and there solitary on the telephone poles. A great noise was heard at certain places being made by red cicadas (*Cicada platypleura*) known locally as *Juljul-dagh* which had gathered on camel thorns. They are found plentifully on the poplars growing alongside the road from Kabul to Paghman. At Karrauddin also adjacent to the place where we were putting up the first night, a few mulberry trees were noticed almost covered with the insects and the noise they were making was to be heard from a distance. They are said to be gathered and eaten by the villagers in times of scarcity.

Karrauddin and its inhabitants.—Karrauddin is a small village about twenty-five miles from Mukar and two and a half from the south-west shore of Ab-istadeh. It consists of about fifty or sixty mud-houses, and the inhabitants are all cultivators. Most of them do not know swimming and only a few are interested in shooting as cartridges are very dear and not easily obtainable in this locality. They usually catch birds in winter when Ab-istadeh is turned into a sheet of ice. At some places there remain small pools of water where coots (*Fulica atra*) locally called *Qashqal* collect in large numbers. These people believe it due to the body heat of the birds that the pools remain unfrozen. Two men hold a long rope stretched across a pool and draw it from one side to the other, thus forcing the birds to climb out on to the ice-sheet, where they catch them by hand or strike them with sticks. According to the locals it is on account of the large amount of fat accumulated on their bodies in winter that the birds are unable to fly easily. The flesh is much relished by them, though at Kabul where the birds are plentiful in poulterers' shops in early spring, autumn and winter, it is not generally liked by Kabulis.

The bird which the inhabitants of Karrauddin esteem most is the pelican, *Pelicanus onocrotalus*, called locally *Qutan*. Whistler (3) records its occurrence at Kanadhar, Natali, Khusan and Hamun-i-Sabari, and Sultan Baber (4) in Kohistan. The latter says, '. . . on the banks of river Baran, great numbers of cranes are caught . . . as well as . . . the Khawasil. The last-mentioned fowl is rare.' River Baran is the present Ghorband river and *Khawasil* is the Arabic name of pelican. There is no doubt the bird is never seen in Kabul markets, but it is certain it flies over the city and sometimes descends on Wazirabad marshes about two miles north of Kabul. Recently there was a bird kept by Dilbar, the owner of a café at Kabul which was caught in the said marshes and its head is still fixed on the wall of the café-room as a decoration. Some twenty years ago Sardar Inayat-ullah Khan had a pair of pelicans which lived in his house for many years. At Ab-istadeh too the birds descend for a short time on their way to north but people knowing the proper time manage beforehand to have a gun. The bird has, in fact, a good quantity of flesh but it is not the bird's flesh that is so much sought after as its fat. This is believed to be a great remedy for certain ailments and much valued throughout the country. It is collected at Karrauddin and stored and sold at the rate of twenty Afghanis[1] for a quantity filling a hen's egg.

Ab-istadeh.—Early next morning, 17th July, we went to Ab-istadeh, a large sheet of bluish water with a wavy surface reminding one of a sea. It is situated at an elevation of about 7000′ in an open plain (as I have already mentioned (5) among other features of the lake), with Dila on its north, Nava-i-kalan on the south, Dila and Nava-i-kalan on the east and Nava-i-khurd on the west. No trees except those already named are to be seen up to a distance of two or three miles from the water. Cultivation ceases at a distance of about a mile where low wild shrubs follow. Among the latter the usual camel-thorn is predominant. At some places, however, another low shrub of yellow flower-heads (*Compositae*) is met with, called locally *Arghozak*. It has woody branches and rather fleshy

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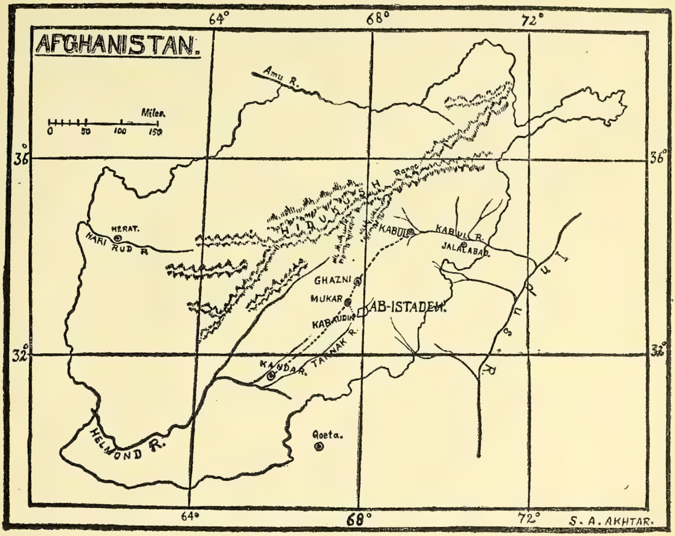
[1] Equal to about five Indian rupees—Eds.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AB-ISTADEH.
KARAUDIN
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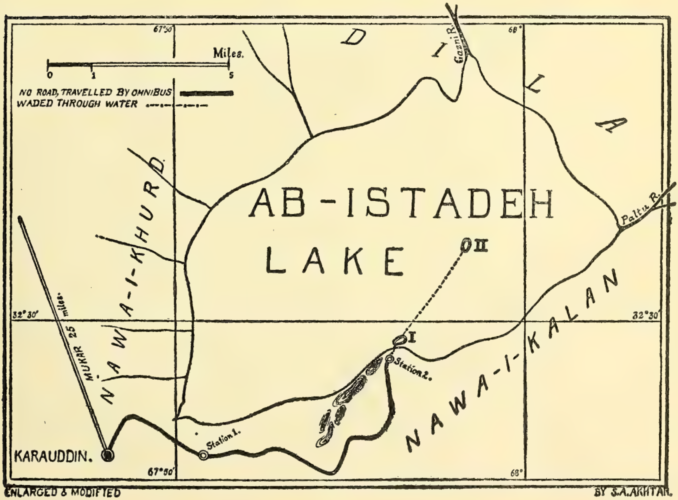
KANDAR.
HELMOND R.
Qoeta.
INDUS R.
S. A. AKHTAR.

Map of Afghanistan, showing situation of Ab-istadeh.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ENLARGED & MODIFIED BY S.A.AKHTAR.

Ab-istadeh lake showing route travelled by the author.

leaves and is widely distributed in the country being generally confined to wastes and other dry places. I did not find at this end of the lake any growth of Tamarisk, locally called *Gaz*, as mentioned by Elphinstone (6). Within fifty to a hundred yards from the water the ground is mostly devoid of vegetation and at some places whitish encrustations of salts are found. At some points the low, spreading and salt-loving shrub bearing small rosy flowers, *Frankenia laevis*, is met with. It appeared from water marks on the shore that water of the lake had receded to a distance of forty to fifty yards during the last two or three months. Footprints of various birds were visible but no eggs were seen on the banks as has been recorded by Sultan Babar (7). No animals were observed on the shore except some black ants and a kind of earwig (*Forficulidae*) boring the earth.

It was 6 a.m. when we reached our first station on the bank of Ab-istadeh. The sky was clear and the temperature of the air was 20°C. The air was clear but stank, and it remained so throughout the day and night. It smells like sulphur dioxide or sulphuretted hydrogen which may probably be liberated by the disintegration of some organic compounds or microscopic algae under water. Humidity was 52 per cent and as the sun rose higher and higher the atmosphere became hazy. At about 9 a.m. and later cyclones appeared on the plain which made the sky as if cloudy. The water of the lake was concentrated brine but clear and transparent; its temperature was 17.5°C. and density 1.035. The Karrauddin people do not bathe in this water as they say it produces a burning sensation which neither myself nor any of my companions experienced. The soil of the bottom was dark green or blackish and stank. There were no submerged plants, except a kind of grass which grew very thinly near the shore. I searched for animals; there were no fish, and other kinds were not numerous. A species of water-skater (*Notonecta* sp.) called locally and aptly *Ab-bazak* or swimmer, a species of small brown water-beetle with longitudinal striations on its elytra called locally *Qanghozak-i-abi* or water beetle and the larvae of a kind of midge (*Chironomidae*) were present.

It was twenty minutes past six when I first noticed a flock of some twenty flamingoes from a distance, flying past in a straight line. They were seen through a telescope and easily recognised by the colour of their legs and wings and the shape of bill. At Kabul they are said to fly over the city and sometimes descend over Wazirabad marshes on their way north in early spring. There they are called *Qāzi-i-husaini* or goose of Hazarat Husain. Their red colour is attributed to the idea prevailing among Qazilbash people that the bird had rolled in grief in the blood of Husain who was slain at Karballa. Hence they neither fire at the bird nor eat of its flesh as a mark of reverence. The inhabitants of Karrauddin do not understand the name *Qāz-i-husaini*, they call it *Ding*, shoot it and eat its flesh eagerly. The Ding described by Sultan Baber (8) is probably some other bird as he defines it thus, 'Ding . . . is a large bird. Each of its wings is the length of a man; on its head and neck there is no hair; something like a bag hangs from its neck, its back is black, its breast white; it frequently visits Kabul. One year they caught and brought me a ding which became very tame. The flesh which they threw it, it never failed to catch in its beak, and swallowed without ceremony. On one occasion, it swallowed a shoe well-shed with iron; on another occasion it swallowed a good-sized fowl right down, with its wings and feathers.' I made much inquiry about the word *ding* and came to know that the inhabitants of Karrauddin mean nothing else than a flamingo.[1]

As we were told that there are two hillocks in the lake about the middle of its southern shore and different kinds of ducks and other aquatic birds breed there, we proceeded towards east. We might have travelled two or three miles from our first station when I saw a big goose with nine young proceeding towards water. On seeing us approaching it flew away and I failed to see it properly. The young were white in their downy stage, their flat bill and feet being black and toes webbed. There was a median longitudinal black band on the back which widened on forehead, shoulders, wings, hips and on the tail. The band begins a little above the nostrils and passes over the eyes on each side of the head.[2]

First hillock: the breeding place of aquatic birds.—About a mile ahead the banks of the lake were covered by more numerous shrubs and here I saw another flock of flamingoes at a distance containing ten birds only. We had now travelled about seven miles from our first station when we saw a group of small hillocks along the shore on our left, and having crossed them we saw the first hillock in front of us about a quarter of a mile inside the lake. The water being only ankle-deep we waded to it and found it to be about four and a half hundred feet long and a hundred feet wide and sixteen feet above water. It is a flat-topped mound or islet nearly parallel to the shore. Here and there were seen branches of a herb, *Astragalus* sp., creeping over its surface, otherwise its surface was thinly covered with low bushes of camel-thorn. Some broken egg-shells were seen scattered among the bushes. Some red feathers and quills lying here and there on the lower slopes of its sides, showed it to have been a breeding place a few months ago when it was doubtless well-surrounded by water. Feathers and quills of various aquatic birds are found plentifully at certain spots on the shores, and the people of the neighbourhood collect them for sale or for their own pillows, etc. As soon as we reached the islet hundreds of big birds became visible in the distance to the east standing in water, and the telescope revealed all of them to be flamingoes. Taking hold of his gun Mr. Shalizi hastened towards them but while he was still about a mile away all the birds flew off and my friend had to return. At 8 a.m. the

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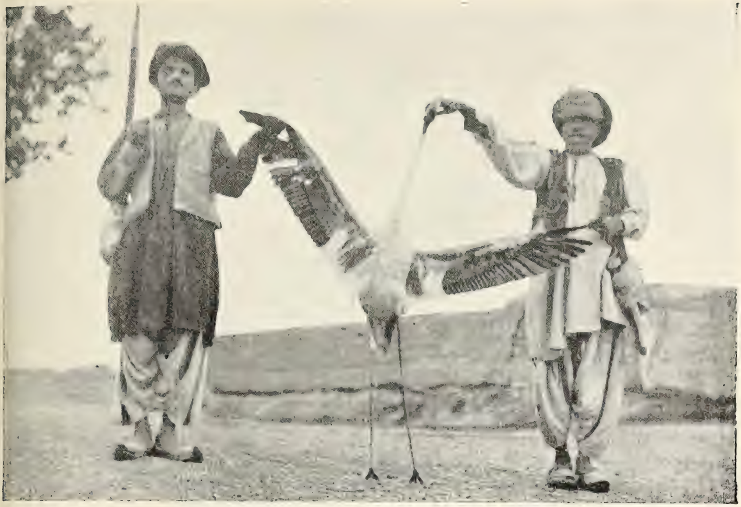
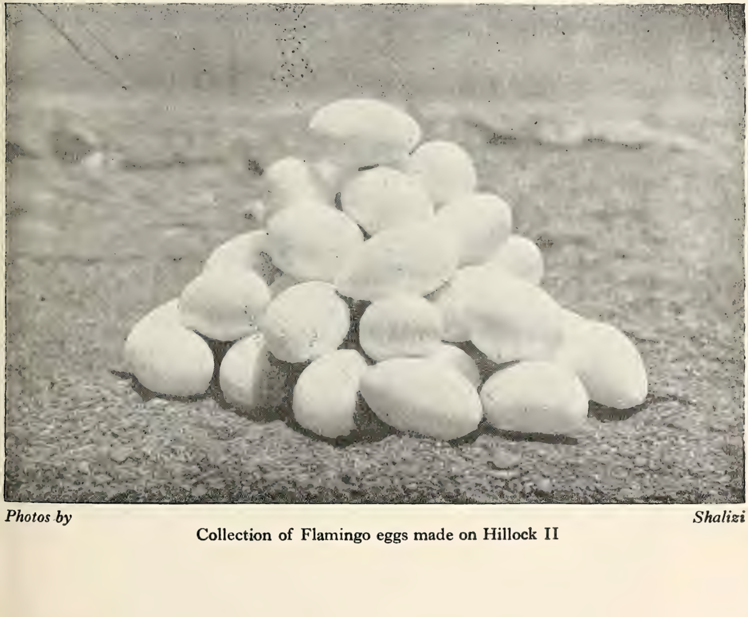
[1] The *Ding* of Babar's description is without doubt the Adjutant Stork (*Leptoptilos dubius*) as identified by Sálim Ali. See 'The Moghul Emperors of India as Naturalists and Sportsmen', *J.B.N.H.S.*, Vol. xxxii, p. 62 (1 Aug. 1927)—EDS.

[2] From a sketch sent by the author, presumably the Ruddy Sheldrake [*Casarca ferruginea* (Pall.)]—EDS.



Rosy Flamingo shot on outskirts of Karrauddin



Photos by *Shalizi*

Collection of Flamingo eggs made on Hillock II

temperature of the air was 29.6°C. and humidity 35 per cent. During our stay on this islet which lasted up to 1.30 p.m., many flocks of flamingoes were noticed flying past in straight lines, and containing from two or three to thirty birds each. Most of them as already stated were flying eastward where they were gathered in large numbers. Unfortunately we had no telephoto-lens otherwise we might have got some beautiful photos of the birds.

The problem was how to reach the other island hillock. Against our expectations, we could not procure in the village a *Jalla* (a few inflated sheep-skins bound together) to float over the water. While we were discussing the matter three of my students, Mr. Qadir, Mr. Sulaiman and Mr. Ali Ahmad, who are good swimmers, entered the lake and began to walk through water in the direction of the hillock. It was 10 a.m., and a quarter of an hour later another batch of five followed them in the same manner. They were also good swimmers but they took along with them a rope and a well-inflated motor-tube as a precautionary measure. The first batch went on till in an hour it was out of sight, and soon the second batch also disappeared. It was in about another hour that we could make out by telescope (as the atmosphere was somewhat hazy) all of them together and returning hurriedly. Altogether they took full two hours and twenty minutes to return to the shore and brought along with them fifty eggs in the netted motor-tube floating over water. It is estimated that the second hillock cannot be less than three miles distant from the first. The students waded most of the way as the water, in these days, was nowhere deeper than four feet. In some places the soft bottom mud was a foot deep.

Second hillock: the breeding place of flamingoes.—This is also a flat-topped hillock but smaller and lower than the first one. The students paced it to be about two hundred and fifty feet long, seventy feet wide and estimated it as twelve feet above the water at the highest point. There was no vegetation on it. As soon as they reached there, a large number of birds, who were apparently sitting on the ground took to flight leaving their eggs lying about on the ground. At the margin of the central flat portion small depressions were noticed at many points in which eggs were lying in pairs, otherwise hundreds of them were scattered singly all over the bare ground. There was neither any sign of nests nor were there any young ones about. Feathers and quills were seen littering the ground in far greater quantity than on the first hillock. Moreover a few skeletons and various parts of birds were found of which one complete and a few parts like wings, etc. were brought back by the students. These proved to belong to flamingoes.

At the hour when we left the hillock and returned to our first station, the air temperature was 29.6°C. and its humidity 35 per cent. We appointed a few shikaris to shoot for us a few of the red birds we had seen, and the skeletons of which we had examined. They remarked that these birds usually came early morning and evening to the shores in search of food. The men returned at 5.30 p.m. when the air temperature was 24°C. and humidity 50 per cent; one of them with two Common Sandpipers (*Actitis hypleucos*) and the other with a flamingo which definitely proved to be *Phoenicopterus ruber roseus* (Pallas). I skinned it and dissected its gizzard which contained clay, some sand, three water beetles, ten water-skaters and twenty-three larvae of midges (*Chironomous*). But most numerous were the remains (head and abdomen) of black ants, and there was not a single earwig.

Summary.—Ab-istadeh is a salt-water lake with bare shores. There are two hillocks (islets) in the lake, one about the middle of and near its southern shore, and the other about three miles further in a north-easterly direction. The water of the lake, at the time of our visit (middle of July), was nowhere deeper than four feet between the two hillocks. Flamingoes as I conjectured (9) do come here from India [? EDS.] in early spring in large numbers to pass the summer; they decidedly belong to the species *Phoenicopterus ruber roseus* (Pallas). At Karrauddin, a village near the south-west corner of the lake, people call this bird *Ding*, Its food here consists of water-beetles, water-skaters, larvae of midges in water and black ants. They breed on both the above mentioned islets, in early spring but a later brood is carried on in July only on the second hillock. Fifty hard set eggs were collected from the second brood. Eight of these measured: 87.5 – 99.0 mm × 55.0 – 60.0 mm. Eggs are not found on the shores these days as was apparently the case in Sultan Baber's time. One Rosy Flamingo was shot, skinned and stuffed; it is now preserved in the Faculty of Science, Kabul, and measures: Wing 430; Bill 145.5; Tarsus 340 mm.

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A NOTE ON THE COLLECTION, CONDITIONING AND TRANSPORT OF FINGERLINGS OF *CATLA* IN THE MADRAS PRESIDENCY.[1]

BY

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Catla catla (Ham.), which is the best of the fast-growing carps, is very well suited for pond-culture. It is therefore extensively stocked in the provincial waters by the Department of Fisheries, Madras, for providing an increased supply of food fish to the public.[2] With the growing popularity of fish farming, there is an increased demand for a large stock of fingerlings. The present note which describes the chief methods to be adopted for successful stocking, may prove helpful, it is hoped, for a fuller exploitation of the sources of *Catla* fingerlings.

In the tea-coloured, rapid moving, flood waters of the Krishna and Godavari rivers, *Catla* spawns during the South-West Monsoon (July to October). The weather, as well as the waters, during this season afford the optimum conditions for the spawning of the fish. The flow and rolling nature of the waters, the flavour, the alluvial content and the superoxygenation of the waters, which are surcharged during the season with electricity discharged by lightning, are the important factors that make the environment favourable for the spawning of *Catla.* My observations[3] on the Bundh-types of tanks in Bengal confirm my statements regarding the optimum conditions in rivers for the breeding of *Catla.*

The eggs (unfertilised ova) of *Catla* are definitely pelagic, as per reports of the local as well as Bengal fishermen. I am able to confirm these reports by my observations[3] in river-survey work for the location of spawning grounds of *Catla* in the Krishna river, and also by my study of the breeding of the carps in the Bundh-type of tanks in the Midnapore District (Bengal). The eggs of *Catla* appear in whitish masses in the upper reaches of the rivers, where the beds are gravelly or stony, and drift down with the current along the sides of the river, where the current is less turbulent. The eggs hatch out within a period of 12 to 24 hours according to my observations. Whether the water is stagnant or flowing, shallow or deep, matters little for the hatching out of the eggs. Whether the eggs hatch out in the turbulent river, or in the irrigation channels depends on the distance between the spawning locality and these water courses. In Bengal the spawning of carps is in the Bundh-type of tanks and the eggs hatch out under the same conditions. In the case of *Catla* the hatching of the eggs takes place either in the rivers themselves or in the irrigation channels that branch off from the rivers. Fingerlings of *Catla* which happen to enter tanks through inundation or irrigation channels, grow into the adult and marketable size by the following summer, which may be said to extend from February to June in Madras. Fingerlings that come into the tanks are but a microscopic minority of the year's progeny. The majority enter the paddyfields, where they meet premature death, either by being trapped in ingeniously woven basket cruives, locally known as *Mavulu* (Telugu) [1], or through destruction by the natural enemies of the fish like birds, crabs and snakes. A very large number of the fingerlings also die on account of the drying up of the paddy flats. The *Mavu* (pleural—*Mavulu*) is placed across the bed of the stream, any side-flow of the water in the stream being prevented by the construction of temporary bunds with sand, clay or twigs. These basket traps are also set up across the sub-channels and at the drops from the higher to the lower flats. Fry and fingerlings moving up and down the current are entrapped in these fixed 'engines' which form a permanent feature of fishing throughout the irrigation season. To find out trapped fingerlings is the common and existing practice. But there are several batches of Fishery Surveyors, working in the three major rivers in the Presidency, the Godavari, the Krishna (including the Tungabhadra) and the Cauvery, for locating the spawning grounds of *Catla*.

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[1] Published with the permission of the Director of Industries and Commerce, Madras.

[2] The first stocking operation was conducted in 1922.

[3] This is my personel experience during my study of the conditions made during July 1944 when I was deputed by the Madras Fisheries Department for that purpose and also to transport a consignment of larvae and fry of Bengal Carps (*Catla*, *Rohu* and *Mrigal*), which I was fortunate enough to accomplish successfully.

These immature fish are either sold in the market, or consumed by the men that trap them. These men are mainly either tenants of the holdings or their menial servants. 60 to 75 per cent of catches thus made are *Catla*, but cat-fishes, crabs and prawns are also trapped in small quantities. The collectors, though they are none but the innocent agents of the destruction of the fish, have singularly misplaced sympathies. While destroying the potential fishery in its infancy, they set free the enemies of the fish, like the crabs which burrow into and damage the bunds of the fields. When trapped in the baskets along with the carps, the crabs almost always feed upon, or injure the carp fingerlings irrecoverably.

For purposes of stocking, collectors proceed to the spot where these basket-traps are fixed, and select the fingerlings of *Catla*. They then transfer the fingerlings in earthen vessels directly to the stocking pond. If intended for transport over a long distance, the fingerlings are taken in tins or brass vessels, or earthen pots to the conditioning pond. In the case of distant transport, it is well known, that the fish have to be conditioned in specially designed boxes. The period of this acclimatisation to limited space, and of starvation varies with the size and health of fish, the bigger and healthier fish requiring a longer treatment extending to three days, the average being two days. Fingerlings of about three inches in size are best suited for transport. Experiments in transporting fry below one inch and a half in length practically without conditioning, have been, however, successful.

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[1] Variations in size and mesh are indicated by the local prefixes to the word 'Mavu'.

The following precautions have to be taken in the conditioning and transport of *Catla* and other freshwater fish:

1. Wire-meshed conditioning boxes, especially those freshly painted, are best avoided, since the fingerlings often browse on the sides and suffer badly. If wire-meshed boxes have to be used it is best that the boxes with the smallest meshes are used for the sake of smoothness to the surface, as the bigger the mesh, the greater the risk of injury to the fingerlings. Close-meshed box-traps of cane, bamboo, etc. are not only the best, but cheap and more portable.

2. Ponds with a muddy bottom should be avoided, since wading through by the attendants disturbs the bottom, and imparts suspended impurities to the whole volume of water, thereby rendering it unwholesome to the fish, as the impurities clog the gill filaments and produce asphyxiation of the fish. If ponds with muddy bottoms cannot be avoided, a submerged wooden platform may be provided.

3. Shade is essential on the boxes. A 'pandal' is necessary in the absence of natural shade.

4. Precautions against sudden changes of physical and chemical conditions should be taken. The optimum temperature is 26.5°C. Temperatures below 26°C. and above 29°C. are fatal to the fingerlings.

5. On no account should the fingerlings be handled with one's bare hands, or friction caused on their bodies. Rough handling removes the slime and scales on the body and makes the fish more vulnerable to the attacks of fungus and bacteria. Soft hand-nets alone are to be used.

6. For transport, the use of clear, cool, natural and decanted or filtered water is strongly recommended. Even slightly brackish water is harmful to the fingerlings.

7. Transport operations should be avoided between 10 a.m. and 3 p.m. They should be done before 10 a.m. or after 3 p.m.

8. During transport over long distance, change of water at least after every hundred miles, or every four hours, is necessary. Chlorinated drinking water is not recommended.

9. Water taken from other sources, including railway hosepipes, taps, etc. should be allowed to cool and settle down at least an hour before use.

10. Removal of water and replenishing of containers can be done easily and quickly by gently tilting the tin-carrier to allow the water to run out. Fresh water should be poured from a moderate height through the perforated lid in place. Strong currents led directly into the tin-carriers disturb and cause shock and even death, to the fish.

11. Woollen covers themselves are non-conductors; yet wetting them will help the whole process.

12. In railway trains, the tin-carriers are best transported in the brake-van nearest to the engine, to avoid the risk of violent jolting.

13. For the absolute safety of the fish, during transport over long distances, 50–60 fingerlings may be conveyed in each tin-carrier. However, an experiment in transporting 130 fry of less than two inches in length has been successful, even without conditioning. The tin-carrier has a capacity of 12 gallons, but it should not be filled to its full capacity. Some air space should be left above the surface of the water. Ten gallons will be a very convenient volume of water for the transport of fish without the risk of asphyxiation.

14. The physical conditions existing in the water body which is intended for stocking the fish have to be identical with those in the tin. For achieving this end, the water in the carrier should be gradually replaced by tank water. After allowing some time for the fingerlings to reconcile themselves to the altered conditions, slowly dip the carrier in the tank, and remove the lid to allow the fingerlings to work their way out into the open water. Stocking should be preferably done in the early hours of the day, when the temperature of the open body of water is near the optimum temperature of 26·5°C.

15. After a long period of starvation and travel, the fingerlings are naturally too weak to find their proper sheltered spots in the new waters. They will be lurking just along the margins until they get accustomed to the new environment. This is an opportunity for poachers and birds of prey. The stocking operator will do well to guard the fingerlings against these enemies for a few hours till the fry gather sufficient strength to fend themselves.

[1] The following is a Note by B. Sundara Raj, Director of Fisheries, Madras, published in the Service Bulletin No. 5 of the Madras Fisheries Department.

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[1] Administration Reports of the Madras Fisheries Department from 1922–23 to 1941–42.

Catla catla

Tamil – *Thoppu meen* (Salem, Tanjore and Coimbatore Districts).

Telugu—*Botcha* or *Kistna Botcha*.

With the exception of the Mahseer found only in hill streams, this is the largest carp in India. It attains a maximum length of 6 feet and a weight of 140 lb. In the Madras Presidency it was found originally in rivers and tanks north of the Kistna river. Since the construction of the Cuddapah-Kurnool canal, it has found its way into the Pennar river and the tanks of the Pennar system in the Cuddapah and Nellore districts. The Fisheries Department has been endeavouring to permanently establish this fish in the tanks and rivers of South India by annually stocking suitable reservoirs and rivers with fingerlings from the Godavari. After nine years of stocking, the fish have established themselves in the Mopad reservoir in the Nellore district and there are signs that they are now breeding in the Mettur reservoir and the Cauvery system.

Catla is a hardy fish, which, when young, stands transport well over long distances by rail or road. With a little care young *Catla* of 2 to 5 inches can be transported to any distance without undue casualty. Though somewhat bony it is an esteemed food fish when not exceeding 2 feet in length; larger fish are coarse. Though believed to live both in fresh and slightly brackish water, the growth in brackish water is stunted and very poor. It breeds during the south-west monsoon in rivers and will not breed in small ponds or tanks. Fry for stocking are, therefore, collected from rivers. It is easily the most rapidly growing fresh water fish in India. For record growth they must be reared in weedy ponds with abundant fresh water snails; the water, as stated above, must remain absolutely fresh throughout the year for best results. Being a rapid grower it is specially recommended for ponds or wells which do not hold a perennial supply of water. From experiments it is found that young fish measuring ½ inch to 1 inch attains on an average a length of 1 foot in 6 months and 18 inches to 2 feet in the first year in ponds and wells. In large reservoirs with perennial water, it attains 3 feet to 3½ feet in length and 30 to 40 lb. in weight in 2½ to 3 years.

NOTE ON FRESH WATER FISHES OF BOMBAY AND SALSETTE ISLANDS[1]

BY

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(1 *photo and* 4 *text-figures*)

Scarcely any account exists at present of the fresh water fish fauna either of Bombay or of its adjoining island on the north-west, known as Salsette. Even the official gazetteer for this area (Thana District) contains no record of the fresh water fish life of the islands of either Bombay or Salsette. Day, in his *Fishes of India*, refers to Bombay as the habitat of only a small number of fresh water species but no record is available of the presence in or round about Bombay of some of the fishes which are stated by him to occur there. Fowler's 'Notes on Fishes from Bombay'[2] describe only the marine forms, whereas Spence and Prater in 'Game Fishes of Bombay Presidency, etc.',[3] deal only with such fresh water forms as are suitable for angling. Scientific investigators desirous of knowing the entire fish fauna of this area for either commercial or study purposes, are thus often disappointed.

Further, it is necessary to record some of the important varieties which have been introduced from outside in this area and which, although exotic, now form a part of the local fish fauna. Such a record is undoubtedly essential to understand the natural distribution of fish in this locality. The purpose of the present paper is therefore, to furnish an up-to-date list of the fresh water fish occurring around Bombay and to provide a short account of the varieties introduced from outside.

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[1] I am grateful to Dr. S. B. Setna, Director of Fisheries, Bombay, for his constant encouragement and guidance in the compilation of this paper.

[2] *J.B N.H.S.*, 31, (1926), pp.770-79 and Vol. 32 (1927), pp. 254-63.

[3] *J.B.N.H.S.*, Vol. 36 (1932), pp. 29-66.

The geographical position of Bombay and Salsette is sufficiently well known to need further description. Salsette Island, which was formerly apart from Bombay, is now connected with the island of Bombay by causeways and the two are now separated from the mainland of India only by the Bassein creek in the north and the Thana creek in the east, both creeks being formed by the bifurcation of Ulhas river to join the Arabian Sea. In the north eastern part of Salsette lies a range of small hills where are situated the sources of such small streams as Borivli (Dahisar nala) and Vehar (Gopar river) nalas flowing towards the west and south respectively.

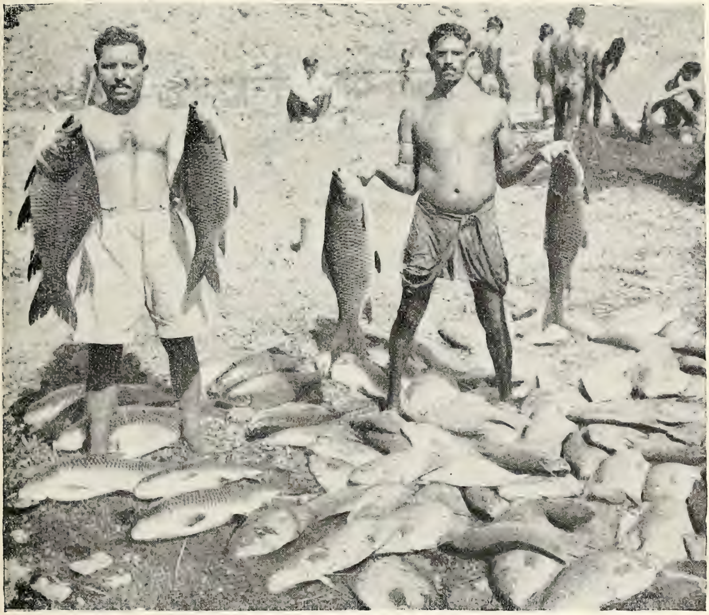
Till the middle of the last century Salsette Island had very few perennial reservoirs except scattered ponds in villages and pools in the beds of the two aforesaid streams. The completion of the Bombay Municipality's water schemes resulted in the formation of the Vehar lake in 1858 and the Tulsi lake in 1879 the nucleus of the water in the catchment areas being furnished by the impounding of the aforesaid streams.

The Powai lake was completed in 1891 and a smaller lake named Pokharan, near Thana, was completed in 1880. These lakes form, therefore, the main habitat of whatever fresh water fish is available around Bombay. The overflow from Vehar and Powai pours into the bed of the Vehar nala and thus distributes the aquatic life of the lakes to places outside the catchment regions, finally discharging into the sea through the Mahim creek. The water below the Tulsi lake, winding its way at the foot of the hills containing the Kanheri caves and gathering additional volume from streams in other hills, forms the Borivli stream, which running via Borivli and Dahisar empties itself into the Arabian Sea.

The Vehar and Tulsi lakes are reserved for the supply of drinking water to the city of Bombay and the Pokharan lake to the town of Thana. Water from the Powai lake having been pronounced undrinkable is stagnant throughout the year and the lake is partially open for fishing. The volume of water in the Borivli and Vehar nalas, including a few scattered tanks, is not perennial. Thus, only the Powai lake is the sole habitat of fresh water fish life in this area.

The Powai lake, which is about 17 miles to the north-east of Bombay, was constructed out of a small valley by the erection of a masonry dam across two hillocks. It is approximately 370 acres in area. The banks of the lake are covered with jungle vegetation, and its bed is made up of loamy soil and interspersed with a few rocks and old submerged stems of trees. During the monsoon, the volume of water increases considerably, the lake being fed by small streams rushing down the adjoining hill region extending over about 17,000 acres. The maximum depth of the lake is about 40 ft. The annual rainfall in the region of the lake is about 100 inches, and the lake overflows for about 60 to 70 days during the monsoon.

Fish of Powai Lake.—A vital factor to be borne in mind in the compilation of a list of the fishes in the Powai area and the adjacent



Three year growth of Catla (extreme left in hand) and Rohu (remaining three) fattened in the Bandra pond.

region is that all of them are not indigenous. The Fisheries Department of the Province has introduced into the lake, at the request of the Bombay Presidency Angling Association, several varieties, including estuarine fish as well as exotic fresh water forms. The indigenous fish recorded from the lake are as follows :—

	Scientific name.	*Local name.*
[1] 1.	*Barbus* (*Puntius*) *sarana* (Ham.)	Khaul Masa.
=	*Barbus* (*Puntius chrysopoma* (C. V.)	Sava masa.
2.	,, ,, *amphibius* (Cuv. V.)	Khiret.
3.	,, ,, *vittatus* Day	
4.	*Labeo ariza* (Buch)	Kavdasha.
5.	*Rasbora daniconius* (Ham.)	Kadavali or Dandavan.
6.	*Danio malabaricus* (Jerdon)	Pidatoli.
7.	*Chela clupeoides* (Bloch.)	Salpe.
8.	*Garra mullya* (Sykes)	Mulya.
9.	*Heteropneusteus fossilis* (Bloch-)	Narshingali.
10.	*Mystus gulio* (Ham.)	Shingali or Shingati.
11.	,, *cavasius* (Ham.)	Shingali.
12.	*Nemachilus botia* (Nom.)	Murra or Muri.
13.	*Lepidocephalichthys thermalis* (C. V.)	,, ,,
14.	*Aplocheilus lineatus* (C. V.)	Piku or Taragya.
15.	*Macropadus cupanus* (C. V.)	Choti Khajuri.
16.	*Anabas testudineus* (Bloch.)	Khajuri.
17.	*Glossogobius giuris* (Ham.)	Kharba.
18.	*Ophiocephalus gachua* (Ham.)	Dhok.
19.	*Mastacembalus armatus* (Lacip.)	Wam.
20.	*Megalops cyprinoides* (Brouss.)	Washi or Wadas.
21.	*Lates calcarifer* (Bloch.)	Khajari, Jitada, Khajuri.

Fingerlings of *Megalops cyprinoides* and *Lates calcarifer*, both of which are local estuarine fish, have been introduced mainly to meet anglers' needs but they are not expected to breed in the lake. The bulk of the other recorded specimens are of small size, and are thus of minor commercial importance.

The largest indigenous fishes in the lake, viz. *Barbus sarana* or the Common Olive Carp and the fresh water Gobi, *Glossogobius giuris* rarely exceed 10 in. to 12 in.[2] in length and are the only forms worthwhile commercially.

Glossogobius giuris breeds freely in the weeds along the borders of the lake, whereas *B. sarana* migrates into the adjoining small streams to spawn during floods in the early stages of the monsoon. Precisely at this time when the fish must be spared, great numbers of them are trapped by fishermen and villagers of the neighbouring areas. The only redeeming feature of this indiscriminate method of capture is that the fish are generally caught not when they are moving up stream but when they are returning from their spawning grounds after discharge of their reproductory products.

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[1] Dr. Hora (*J. B. N. H. S.*, Vol. 43, p. 225) considers *B. sarana* and *B. chrysopoma* as synonymous.

[2] Spence and Prater (*J.B.N.H.S.*, Vol. 136, p. 48) record. *B. chrysopoma* as attaining 2 ft. 9 in. This is probably a mistake if *B. sarana* and *B. chrysopoma* are synonymous. Besides, the colour of the fins on the body of the fish should be olive grey and not orange red as depicted by the authors.

The extent of such protection, apart from being fortuitous, is rather precarious as occasions may arise when floods are of brief duration and the fish which go upstream have to come downstream immediately, and are thus captured before they are able to deposit their eggs.

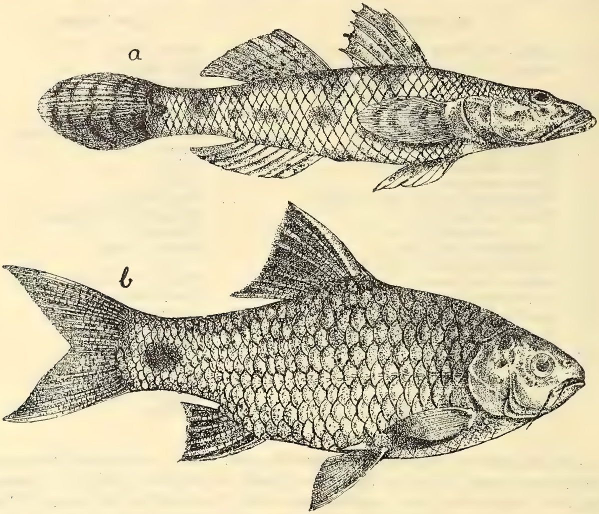

Fig. 1 (*a*) *Glossogobius giuris* (Ham.) ; (*b*) *Barbus* (*Puntius*) *sarana* (Ham.)

The exotic fishes introduced into the lake are as follows:—

1. Catla [*Catla catla* (Ham.)]
2. Rohu [*Labeo rohita* (Ham.)]
3. Mirgal [*Cirrhina mrigala* (Ham.)]
4. Calbasu [*Labeo calbasu* (Ham.)]
5. Gourami [*Osphronemus goramy* (Lacep.)]

Fry of the first four carps were specially imported from Patna and released in the lake after they had been fattened in a small pond. The object of their introduction was to determine whether these important food fishes, which generally breed in large rivers, would breed in the temporary streams which flow into the lake during the monsoon.

Fish of Vehar and Borivli Streams.—The fishes in these streams are, evidently, the same as the indigenous fish in the Powai lake mentioned above. *H. fossilis*, *O. gachua*, *A. testudineus* and *B. vitattus*, which favour the still waters of ponds, are not common in streams. On the other hand, *N. botia*, *Lepidocephalichthys thermalis*, *Danio malabaricus* and *G. mullya*, which are rare in the lakes, are common in the streams, the difference being due apparently to the different ecological conditions required by these fish.

Wallagonia attu, which does not occur in the Vehar stream, figures but occasionally in the lower reaches of the Borivli stream below the dam near the Borivli railway lines, having migrated there from the Ulhas river through the Bassein creek and other small interconnecting channels during excessive floods.

Through the lower reaches of the two streams innumerable fingerlings of *Megalops* migrate into fresh water puddles during the monsoon and are thus often stranded there after the rainy season. Fingerlings of *Chanos* and *Elops* migrate similarly, but they are comparatively fewer in numbers. Fingerlings of *Lates*, *Mugil*, *Eleotris* and *Awaous* migrate upstream as long as there is a tolerable admixture of salt and fresh water. The streams thus contain the following fish in addition to those mentioned as occurring in the Powai lake :—

1. *Chanos chanos* (Forsk.).
2. *Elops saurus* Linn.
3. *Mystus malabaricus* (Jerdon).
4. *Eleotris fusca* (B. Schn.).
5. *Awaous stamiuens* (Val.).
6. *Wallagonia attu* (B. Schn.).
7. *Mugil tade* (Forsk.).

There are several natural ponds in the suburban area, but, as stated at the outset, very few of them are perennial to enable the life they contain to thrive. Improvement of living conditions in the suburban district and the provision of a regular supply of tap water by the municipalities have led to the disuse of such natural ponds as existed. They are becoming increasingly silted every year. During the monsoon, fingerlings of most of the fish mentioned above, instinctively migrate into these tanks from streams below the lakes and inhabit them temporarily. All this fish life is fished out by village urchins during the hot weather before the ponds are completely dry. Deeper tanks afford protection to the fish for a slightly longer time but the fate of these fish is not more assured owing to the uncertainty of water supply, which fails whenever the rainfall is scanty.

Exotic fish fauna.—Reference has already been made to the north Indian carps introduced into the Powai Lake. In addition to these, other useful varieties from outside have also been liberated in different sheets of water in the suburban district where they did not exist previously. They are now thoroughly acclimatised to their new habitat, and may appear to a lay observer as indigenous forms unless told otherwise. A complete list of the exotic fishes occurring in the waters of the Bombay suburban district is as under :—

(1) *Catla catla* (Ham.).
(2) *Labeo rohita* (Ham.).
(3) *Cirrhina mrigala* (Ham.).
(4) *Labeo calbasu* (Ham.).
(5) *Osphronemus goramy* (Lacep.).
(6) *Etroplus suratensis* (Bloch).
(7) *Etroplus maculatus* (Bloch).

(8) *Ophicephalus marulius* (Ham.).
(9) *Gambusia affinis* (Baird.).
(10) *Aplocheilus blochii* (Arnold).

The introduction into the Powai Lake of catla, rohu and mrigal got from Patna has been successful inasmuch as the fish have not only established themselves in the lake but also bred there. Experiments on fattening the fish in the Bandra and Kurla tanks have proved that on an average catla, rohu and mrigal grow to about 5 lb., 2 lb. and $\frac{3}{4}$ lb. in weight in the first ten months, although maximum weights in the same period of 8 lb., 3 lb. and $1\frac{3}{4}$ lb. respectively have also been recorded. Growth in the second year is more pronounced, catla growing to 8–10 lb., rohu to 6-9 lb. and mrigal to $2\frac{1}{2}$–3 lb. In contrast, the local carp *B. sarana* hardly grows to $1\frac{1}{2}$ lb. in two years. These figures clearly establish that catla and rohu are among the most rapidly growing fresh water fishes in India. This fact has, therefore, induced the Fisheries Department, Bombay, to undertake their stocking in our waters on as large a scale as possible, so that once they have bred in profusion, their fingerlings may be used to stock sheets of water elsewhere in the Province.

The aforesaid carps have thrived successfully in the Powai Lake. Specimens of rohu and catla weighing up to 42 and 60 lb. respectively have been recorded from the lake, and confirmatory evidence of rohu breeding in the lake has also been obtained in recent years. The breeding, however, has been on a small scale.

Gourami.—Gourami is now sufficiently well known as a valuable exotic food fish. Its natural habitat is Java whence it was imported into India. The fish was first brought to Bombay from Madras in 1937 as fingerlings, and since 1940 the fish has been breeding freely in the Bandra tank. Fingerlings of this fish have been introduced in Tulsi, Vehar and Powai lakes, where also they have bred in

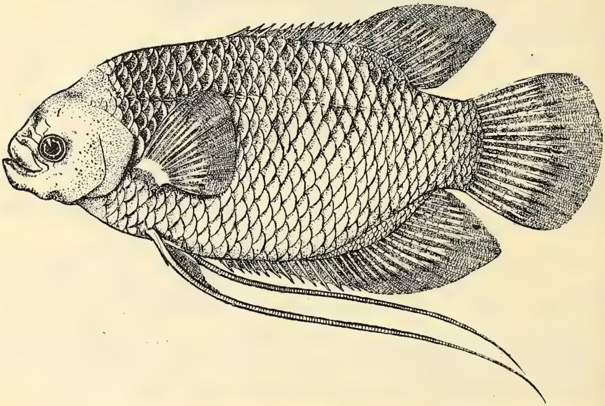

Fig 2. *Osphronemus goramy* (Lacep.).

sufficient numbers. It is herbivorous, feeding mainly on aquatic weeds, and is capable of breeding in confined waters. Its special feature is its habit of building a nest under water very much after the pattern of a bird's nest, where it deposits its eggs. Both parents constantly guard the nest to keep away intruders. Its breeding habits in our waters which have been studied, encourage hopes of its wider diffusion.

Etroplus suratensis, known as 'Pearl spot' on account of the beautiful pearl-like spots on its body, is by its nature an estuarine form capable of rapid acclimatisation in fresh water. The fish is common along the Madras coast and occurs in our Province in small numbers at Karwar and Malvan. Fingerlings of this fish have been imported from Karwar in thousands and introduced into the Mahim-Kurla creeks. The fish has begun breeding in the creeks where it has established itself. It is a herbivorous form like the Gourami and though it does not exceed a foot in length it is a good table fish. The fingerlings are suitable for stocking wells and ponds. The fish has also bred in some temple tanks and wells in the suburbs.

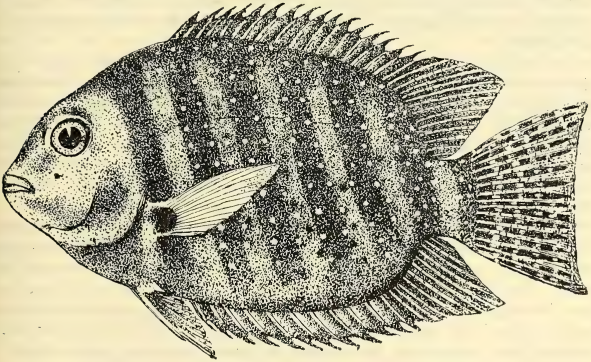

Fig. 3. *Etroplus suratensis* (Bloch).

Etroplus maculatus.—This is another species of the genus *Etroplus*, which has been imported from the Sukesula farm in Madras Presidency. It is a small fish growing to about 3 in. in length, but is, nonetheless, a prolific breeder. It has already established itself in the Bandra creek and it figures regularly in the catches of the fishermen. This fish, like its congener, thrives admirably in fresh water ponds and wells. It is an attractive aquarium fish and is known among fish fanciers as 'Brown Chromide'. It breeds in even the narrow confines of a household aquarium and is exceedingly attractive in its conjugal colouration.

Murrel (*O. marulius*), a popular fresh water fish, was not known in Bombay waters until five years ago. Fingerlings of this fish were brought from the Moola-Mutha rivers in Poona and introduced into some tanks. It migrates from pond to pond. Being very tenacious of life and having a tendency to burrow in mud, it is extremely difficult to eradicate once it is introduced in a sheet of water. Its introduction in conserved waters is not, however, advisable on account of its carnivorous habits.

Gambusia.—The mosquito fish *Gambusia affinis* of American waters was originally imported into Bombay by the Health Department of the Bombay Municipality for anti-malarial purpose. The Fisheries Department has introduced the fish in some of the tanks in the suburbs for larvicidal purposes. The fish breeds abundantly in these tanks and no surprise will be felt if in time to come it spreads to fresh sheets of water and becomes more extensively distributed.

Aplocheilus blochii.—This species is smaller than the local *Aplocheilus lineatus.* It is, however, a more prolific breeder than *A. lineatus* and is an effective larvicide in small stagnant sheets of water. The males have attractive colouration and are suitable for aquaria. The fish was imported from Prantij in Ahmedabad district, and was bred in a tank in the Bombay suburban district. Large numbers of this fish have been transplanted into Powai Lake, where it is bound to work havoc among mosquito larvae in the lake.

It will thus be seen from the foregoing account that the introduction of the several varieties of fish which are of considerable economic importance, has made a substantial addition to the fish fauna of our area. Besides, a large number of the imported carps and Gourami have been introduced in the Ulhas river and other perennial reservoirs in the Province, where they are expected to breed and establish themselves. Although the value of these stocking operations is unassessable in monetary terms, their significance from the point of view of addition of fresh fauna to our waters, and potential food supply to our people is nevertheless great.

EXTENT OF DAMAGE BY THE MOTH *DICHOCROCIS PUNCTIFERALIS* Fb. TO THREE STRAINS OF THE CASTOR PLANT.

BY

A. C. BASU

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The castor plant now plays an important role in the supply of oil. The oils derived from the castor seeds are used in medicines, lubricant purposes and also for the preservation of leather; but great loss is caused due to destruction of the plant by attack of insects. In view of the economic importance of the castor plant it is essential to focus our attention on the improved cultivation and preservation of the plants.

The insect pest which causes havoc to the castor plant in Bengal is *Dichocrocis punctiferalis* Fb. (Pyralidae, Lepidoptera). The larva of this moth bores into the main stem and also attacks the side shoots at the nodes. In addition, it attacks the ripening fruit or the seed capsule by boring into them. The site of attack is easily spotted owing to the presence of the dark brown excreta oozing out from the pierced holes and also it is prominently indicated by the feltlike web covering the infested shoot and seed capsule.

So far, agriculturists are of opinion that the control of *D. punctiferalis* by cultural methods is not worthwhile as the expense of labour is not compensated for by plants saved. The task of controlling this pest is not easy. This pest being a borer the application of any insecticides is not very effective. Cultural methods, though expensive and troublesome, offer a chance of eradicating the pest. So it is felt that the most economical and best remedy against insects attacking crops is the production, where possible, of resistant types. Although it is definite that the insects are plastic in their food selections, still there are quite authoritative indications that resistance to attacks of insects is also an inherited plant character.

In the present paper attempts have therefore been made to explore what food preference *D. punctiferalis* has got on the three strains, viz. RC. 215, EB. 31 and EB. 16 of castor plants and whether it is possible to find out the susceptible type.

EXPERIMENTAL METHODS AND OBSERVATIONS

The experiment was conducted with three strains of castor, viz., RC. 215, EB. 31 and EB. 16 which were replicated eight times in randomised blocks. Each strain was represented in a block by one line measuring 96 ft. Seeds were sown with a spacing of 3 ft. in lines which were 4 ft. apart. In order to study the differences between the strains with regard to the extent of damage by *D. punctiferalis*, counts were taken prior to the harvest of the total number of plants in a line as well as of the number of those attacked. The percentages of the plants attacked were calculated for all the three treatments in different blocks (*vide* Table I.) and the data were analysed statistically.

TABLE I.

Table showing the percentage of attack noted in each block of the three different strains.

Replications	EB. 31	EB. 16	RC. 215	...
I	39.39	38.46	44.90	122.75
II	55.48	16.66	46.15	118.29
III	38.46	24.24	51.79	114.49
IV	21.43	13.79	56.52	91.74
V	26.92	32.35	57.69	116.96
VI	28·56	30.76	57.14	116.46
VII	25·71	22.85	53.57	102.13
VIII	26·66	24.13	34.48	85.27
	262.61	203.24	402.24	868.09

The table of analysis of variance is given below :—

Due to		D.F.	S.S.	M.S.	F.
Replication	...	7	443.61	...	...
			...	1304.63	...
Variety	...	2	2609.27	...	13.694
			...	95.27	...
Error	...	14	1333.91	...	...
Total	...	23	4386.79	Significance—1%	...

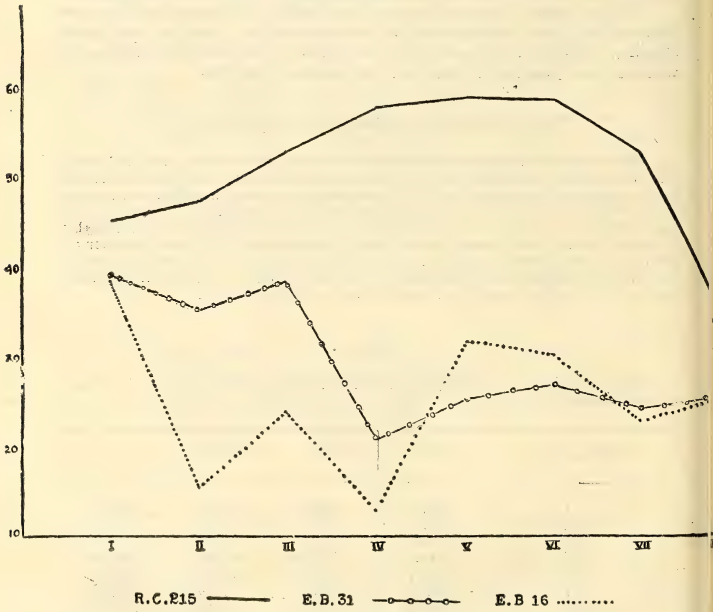
S.E = 9.5%
Total S.D = 113.15%

CONCLUSION

RC. 215	...	402.24
EB. 31	...	262.61
EB. 16	...	203.24

It is clear from the above that RC. 215 suffers most from the attack of *D. punctiferalis*, of the other two strains, EB. 16 seems less susceptible, although the difference between the two is not statistically significant.

The percentages of attack noted in each block of the three different strains has been represented graphically to give a clear idea as to the susceptibility of the strains to the attack of *D. punctiferalis*.



GRAPH

Graph, showing the extent of attack noted in each block of the three different strains.

In the graph it is quite evident that the strain RC. 215 is most susceptible to the attack and the strains EB. 31 and EB. 16 are much less so. The percentage of attack in the last named strain is less than EB. 31 in six blocks out of eight blocks and therefore be regarded as the most resistant strain.

CONCLUSION.

Amongst the three strains RC. 215, EB. 31 and EB. 16, the last one is most resistant to the attack of *D. punctiferalis.*

THE LAC INSECT OF THE WEST COAST OF INDIA

BY

S. MAHDIHASSAN

(*With* 2 *plates*)

Probably the earliest observation on the Lac Insect in India has been made on its West Coast. It is recorded in a Portuguese work, Dr. Garcia de Orto's *Colloquios dos Simples e Drogas e Cousas Medicinaes da India*, printed at Goa in 1563. Garcia was physician to the Governor of Portuguese India and his book is the second that has been printed in India. In 1567 a Latin translation appeared at Antwerp in which the translator, C. Clusius, offered three illustrations of stick lac. Probably Garcia had these illustrations made for his own book but finding them unable to be reproduced in India then kept them unused for four years when Clusius undertook to bring out a Latin edition. These pictures were then copied as wood engravings and finally printed at Antwerp.

Regarding lac, Garcia observes, " Here in Goa a boy brought me a branch of a tree which the Deccanis call the Ber tree (*Zizyphus jujuba*). . . . Because it (the tree) bears little lac they do not value it (the lac), the soil not being suited to produce it (lac)." It must be clearly understood that Garcia was informed of the existence of lac in Goa on a tree which did not give good yields but which, perhaps, were obtained elsewhere.

The next record seems to be by Carter (1) in 1860. The third is by Ryan (2) who found it in Konkan, which he describes as, " a tract of country below the Western Ghats including mainly the districts of Thana, Kolaba and Ratnagiri ". Properly speaking, Goa also belongs to Konkan. Ryan continues to say, " With the exception of Carter, inside the grounds of the old Bombay Mint, in 1860, no record exists apparently of its having been discovered elsewhere in the Konkan. In 1899 I noticed Pipul trees, *Ficus religiosa,* on the maidan in Thana and Khair trees in some forests in the Bassein taluka of the same district bearing lac; but the encrustation on the trees was sparse. Close to Bassein, which is on the sea-coast, roadside trees of *Pongamia glabra* have also been found bearing lac."

As far as I know *Pongamia glabra* does not bear an infection of a genuine lac insect. I have been previously told that lac does grow on this host but on closer examination found the insects to belong to pseudo-lac insects. The insect most common on *P. glabra* is *Tachardina lobata.* This distinction between true and pseudo-lac insects was not made before 1923 when I published an article on the classification of lac insects (3).

Ryan's finding that lac is sparse in Konkan confirms the information conveyed by Garcia. When we try and analyse the cause it would indicate a particular lac insect, which is, however, found wild all over South India. It would appear that being very commonly found observations were not recorded as they might appear commonplace and only foreigners like Garcia, Carter and Roxburgh have done so, for to them lac was an object of intense curiosity. At least in December 1916 while working in the laboratory of the late Fr. Blatter, Mr. Charles MacCann kindly showed me a tree, *Albizzia lebbek*, infected with lac near the Byculla Bridge in the heart of the city of Bombay. It was likewise found on an avenue tree in the city of Madras. It occurs in Travancore and Roxburgh, in 1789, found it at Samulcotta, near Cocanada, on the Coromandel Coast. The insect recorded by Garcia, Carter and Roxburgh is now named *Lakshadia communis*.

As mentioned above, it is usually found sparse, its typical encrustations appearing as *chunks* particularly in localities where the rainfall is early. The explanation given at the end specifies *L. communis*. Fig. 1 here shows a typical encrustation of *L. communis*, at the end of the monsoon season. It was found on *Ficut bengalensis*, at Bangalore, early in November, when in Bombay the same development would be seen early in December. *Ficus bengalensis* is a rare tree in Bangalore where the avenue trees are mostly *Ficus mysorensis*. Fig. 2 was derived from this host plant, again at the end of the monsoon season ; the scale shows the magnification, the smallest units representing millimetres.

When a twig grows vertically the young insects instinctively settle all around it and the final encrustation grows like a collar or a cylinder around the stem. When the twig is horizontal, the larvae settle only on the lower surface. In cases where the twig is inclined, for example 30 degrees from the vertical line, the insects on the lower surface would be far better developed than those on the upper surface of the twig. This is found in many other scale insects and even in some aphids. Figs. 1 and 2 were found on twigs almost vertically grown, or very little inclined towards the earth.

The illustrations of Garcia show the encrustations were derived from a horizontal twig and will be dealt with elsewhere. It is proposed here to examine the illustrations offered by Roxburgh. His communication has appeared with four different illustrations, with very slight modifications, of one and the same original specimen. His article has appeared in the following journals:—

1. *Asiatic Researches* or *Transactions of the Society of Bengal*, vol. 2, pp. 361-64 (1790). Fig. 3 here is derived from this publication, where it is Fig. 6.
2. The above was reprinted in London, in 1807, from which Fig. 4 here has been derived.
3. *Philosophical Transactions of the Royal Society*, vol. LXXXI, Part 2, pp. 228-35 (1791) ; from which Fig. 5 here has been copied. In the original it is Fig. 1.
4. The above reprinted, also in London, vol. 17, pp, 62-67, unfortunately I do not know the date from which Fig. 6 has been derived.

5. *Philosophical Magazine*, vol. 3, pp. 367–69 (1799), also contains an article, but without any illustration.

The earliest picture, which appeared in 1790, Fig. 3, is an engraving on copper taken from an original drawing that shows the encrustation full of wax filaments. In Fig. 3 they arise only from two holes showing that the third aperture, occupied by the anal tubercle, is empty, allowing the exit to be used by the swarming larvae. For details of these apertures the excellent work of the late Rai Bahadur Misra (4) may be consulted. Fig. 3 is better executed than Fig. 4. Fig. 3 shows minimum light and shade and relatively more details on the incrustation ; it gives the impression of being a careful reproduction of an original drawing which was probably done by an Indian artist, under Roxburgh's directions. When the journal, *Asiatic Researches*, was reprinted in 1807, a copy was made, not from the original drawing again, but from the previous engraving of 1790. The engraver was certainly an artist trained in European technique with a strong love for light and shade. The surface of Fig. 4 shows boldly the details which are finely indicated in Fig. 3. In Fig. 4 the stem is shown with a very dark shadow which is self evident on contrasting Figs. 3 and 4. Even if we had not known, which of these two pictures had appeared earlier, the fine details absent in Fig. 4 would indicate it to be copy of Fig. 3 which preceded it. When the original illustration, seen as Fig. 3 here, was being made the young ones were about to swarm and the exit holes, the black dots, later on so conspicuous in Figs. 5 and 6, were more or less indistinct. It represents a transition period, when the anal tubercle is withdrawn within the lac cell and the exterior of lac encrustation shows the presence of black dots indistinctly. The stage shown in Fig. 3 does not clearly indicate that swarming had taken place. Roxburgh sent Fig. 3 as here given for publication in *Asiatic Researches* in 1790.

Very soon after the original picture, seen as Fig. 3 here, was completed the larval swarming had started and the exit holes became very prominent and Roxburgh must have asked his Indian draughtsman to make another picture of the same specimen. This is shown as an engraving, reproduced here as Fig. 5. In the text Roxburgh says he received his fresh specimen of stick lac on 20th November 1789, while minute red insects, the larvae, began to swarm on 4th December. Fig. 3 would show the stage when the anal tubercle had been withdrawn in some cases but the actual swarming had not begun, while Fig. 5 would show stick lac devoid of young larvae. Roxburgh sent Fig. 5 here for publication in *Philosophical Transactions*, the text remaining the same. The picture of stick lac in *Asiatic Researches* 1790, has been indicated by him as Fig. 6 ; the illustration of stick lac published in *Philosophical Transactions* printed in 1791 is marked Fig. 1.

Fig. 5 shows the black dots in parallel rows along the stem bearing the encrustation. With each black dot there are two white spots and these three form a triangular unit. The two white spots lie in front or above the black dot like the mathematical sign of " since ", (∵), and unlike that of " therefore " (∴) where the single dot lies on the top. It means that in the living insect the two white spots in front show the anterior end of the individual. In Fig. 5 all the insects are parallel to each other and the settlement has occurred across the twig, a most unnatural condition which cannot be confirmed by any of my observations. The picture must have been drawn rather mechanically and seems of a poor quality. From the white spots a row of white filaments arise which would be found well explained in Misra's *Bulletin* already referred to. These filaments again are all pointing in the same direction. I have in Fig. 6 a portion of Fig. 5 enlarged to show the black dots (one marked with an arrow) the exits of the young larvae, and above them two white spots (also marked) from where the white wax threads arise. The entire picture, Fig. 5, is a mechanical repetition of the same pattern. Fig. 7 is derived from a reissue of *Philosophical Transactions*. It is a copy of Fig. 5 here and we can see that it is a copy not from the original drawing but from the engraving, Fig. 5. The artist has again tried to introduce more shade by virtue of his training particularly on the cut surface of the twig. However, details are not so well seen in Fig. 7 as in Fig. 5, the usual fate with all copies.

All that now remains to be explained is the reason why lac is found in chunks and why trees fully infected with lac are rare and why, on the basis of such observations, soil and climate have been held responsible for the poor production of lac. *Lakshadia communis*, of all lac insects, shows a great variation in sex ratio. Mother insects feeding on trees well watered, as during the monsoons, give rise to many young ones but the generation may consist of 100 per cent males. The colony naturally dies at once and the species itself is able to continue when a few male insects happen to change their sex. The next generation naturally consists of a very few surviving individuals. Such a species cannot be used for artificial propagation. From the individuals that have reversed their sex the young ones that swarm show the natural preponderance of females. Hence encrustations of lac can be collected only during the monsoon, and as a colony of insects born of a single mother cell. The male larvae that have developed bisexuality become morphologically curious objects. I have called them crown-shaped cells on account of their peculiar shape ; the normal lac cell is a round, spherical object. A crown-shaped cell has been described as a new species of lac insects by Chamberlin (5) as has often happened in cases where systematists have not taken into consideration the biology of the insects they were studying. This phenomenon of sex reversal has been previously (6) illustrated incorporating some of Roxburgh's drawings and the interested reader is referred to it. It only needs emphasising that the species *L. communis* shows this phenomenon to the utmost degree; it is the only wild insect in India. The next worst species is the lac insect of Sindh, *Lakshadia sindica*, which yields only one crop a year, at the end of the monsoon season.

SUMMARY

All over South India a wild lac insect is found, *Lakshadia communis*. At the end of the monsoon season mother insects feed on well watered trees. The next generation in such cases gives rise to

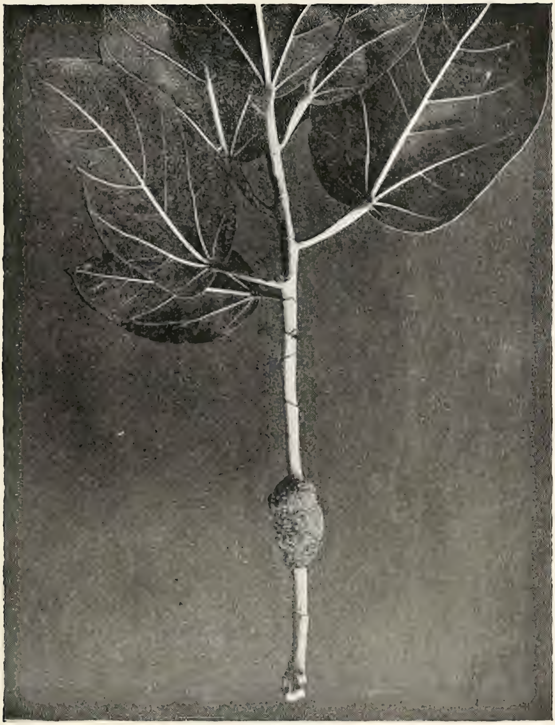
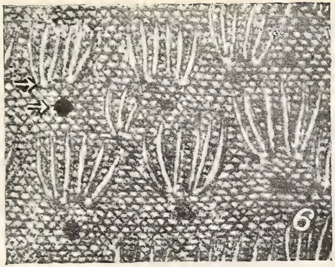


Fig. 1



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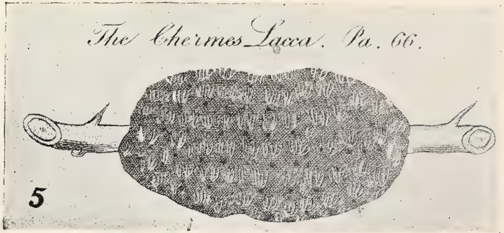
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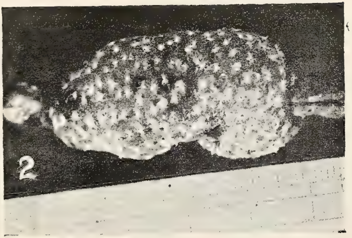
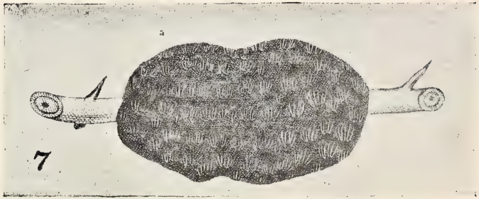


2



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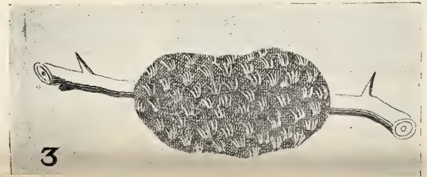
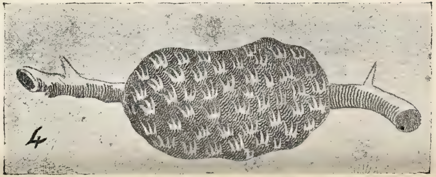


3



4

males. A few change their sex and these rare individuals become mothers of a normal generation which forms encrustations seen as chunks at the end of the monsoon season. While the complicated biology was not known observations correctly made were attributed to an inclement soil and climate for the poverty of lac wherever it was concerned with *L. communis.* Garcia in 1563, Carter in 1860 and Ryan in 1899 found this species on the West Coast of Bombay; Roxburgh also found it on the Coromandel Coast in 1789. Their observations support one another since they refer to the same insect species. Roxburgh's illustrations have been critically studied for the first time since their publication.

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5. J. C. Chamberlin: ' Supplement to a Monograph of Lac Insects,' *Bull. Ent. Res.* (1925), Vol. XVI, p. 35, Fig. 1. His *L. rangoonensis* is a crown-shaped cell of my *Lakshadia chinensis*, from Burma, which has been considered as identical with other lac insects by him.
6. S. Mahdihassan: ' Sexual dimorphism among Lac Insects ', *VII Intern. Kongress f. Ento.* Berlin (1938), Vol. II, pp. 1232-39.

EXPLANATION OF FIGURES.

Fig. 1. *Lakshadia communis* forming a typical small encrustation on *Ficus bengalensis*, monsoon season, Bangalore; somewhat reduced.

Fig. 2. *Lakshadia communis* encrustation on *Ficus mysorensis*, monsoon season, Bangalore; scale gives millimetres.

Fig. 3. *Lakshadia communis*, on *Dichrostachys cinerea*, found on the Coromandel coast, by Roxburgh, on 20th Nov. 1789; the young larvae are about to swarm. The original engraving appears in *Asiatic Researches*, 1790, as Fig. 6. Object seen less than its natural size.

Fig. 4. Same as Fig. 3, original in *Asiatic Researches* as reprinted in 1807.

Fig. 5. *Lakshadia communis*, on *Dichrostachys cinera*, from a drawing probably made on 4th Dec. 1789, for exit holes, through which the larval swarming had occurred, are clearly seen. Original in Roxburgh's article in *Phil. Trans.*, 1791, as Fig. 1. Magnification 11: 10.

Fig. 6. Portion of Fig. 5 enlarged to show three dots arranged triangularly, two white dots above the third dark spot show the direction in which the insects settled.

Fig. 7. Same as Fig. 6 from a reprint of *Phil. Trans.* in 1791. Magnification natural size.

VARIATION IN THE FLOWERS OF *QUISQUALIS INDICA* LINN. (ORDER *COMBRETACEAE*)

By

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The normal flower of *Quisqualis indica* Linn. has five teethed tubular calyx, five ovate oblong corolla, ten episepalous stamens and an ovate oblong unilocular ovary. But amongst the material supplied to students for the practical work it was observed on several occasions that in some flowers there was variation in the floral parts. In all 1,550 flowers were examined to study variation in the floral parts. Out of the 1550 flowers examined, 29 flowers *i.e.* 1·87 per cent showed variation in the number of calyx teeth, corolla and stamens. Ovary was normal in all cases except in the case of fasciated flowers which had bilocular ovary. Details of these are given below in Table I.

Table I.

Serial No.	No. of flowers	No. of calyx teeth	No. of corolla	No. of stamens	Remarks
1	1	3	6	10	one sepal petaloid
2	2	4	5	10	in one flower ½ sepal petaloid
3	1	5	4	10	
4	1	5	6	12	one petal is divided into two
5	1	5	7	10	
6	1	6	5	10	one sepal petaloid
7	1	6	5	11	do do do.
8	9	6	6	10	
9	1	6	6	11	
10	4	6	6	12	
11	2	6	6	13	in one flower two sepals petaloid
12	1	7	5	14	two sepals petaloid
13	1	8	8	16	
14	2	9	9	18	only one flower fasciated
15	1	11	11	20	flower fasciated

Out of these 29 flowers, 7 showed distinct relation in the number of the calyx teeth, corolla and stamens; 13 showed relation in the number of calyx teeth and corolla; 3 showed relation in the number of calyx teeth and stamens; 4 showed relation in the number of corolla and stamens; 1 showed no relation in the number of the calyx teeth, corolla and stamen, and in one flower the number of corolla was double the number of calyx teeth.

The number of calyx teeth, petals, and stamens in the flowers examined are given in Tables II, III and IV.

TABLE II

No. of flower	No. of calyx teeth	Percentage
1	3	·0645
2	4	·129
1524	5	98·398
18	6	1·161
1	7	·0645
1	8	·0645
2	9	·129
1	11	·0645

The number of calyx teeth vary from 3 to 9. The most frequent number of calyx teeth is 5. The frequency of flowers with 6 calyx teeth is very rare while those with 3,4,7,8,9 and 11 is very, very rare. Not a single flower had 10 calyx teeth.

TABLE III

No. of flowers	No. of petals	Percentage
1	4	·0645
1526	5	98·527
18	6	1·161
1	7	0645
1	8	·0645
2	9	·129
1	11	.0645

The number of petals vary from 4 to 9. The most frequent number of petals is 5. The frequency of flowers with 6 petals is very rare, while that of those with 4,7,8,9 and 11 is very, very rare. Like the number of calyx teeth not one flower had 10 petals.

TABLE IV

No. of flowers	No. of stamens	Percentage
1536	10	99·072
2	11	·129
5	12	·322
2	13	·129
1	14	·0645
1	16	·0645
2	18	·129
1	20	·0645

The number of stamens vary from 10 to 14. The most frequent number of stamens is 10. The frequency of flowers with 11, 12, 13, 14, 16, 18 and 20 stamens is very rare. Not a single flower had 15, 17 or 19 stamens.

Correlation of the number of corolla and the calyx teeth in the same flower is shown in Table V.

TABLE V

No. of Calyx teeth	No. of Corolla							Total
	IV	V	VI	VII	VIII	IX	XI	
III	—	—	1	—	—	—	—	1
IV	—	2	—	—	—	—	—	2
V	1	1,521	1	1	—	—	—	1,524
VI	—	2	16	—	—	—	—	18
VII	—	1	—	—	—	—	—	1
VIII	—	—	—	—	1	—	—	1
IX	—	—	—	—	—	2	—	2
XI	—	—	—	—	—	—	1	1
Total	1	1,526	18	1	1	2	1	1,550

Correlation of the number of stamens and calyx teeth in the same flower is shown in Table VI.

TABLE VI

No. of calyx teeth	No. of Stamens								Total
	X	XI	XII	XIII	XIV	XVI	XVIII	XX	
III	1	—	—	—	—	—	—	—	1
IV	2	—	—	—	—	—	—	—	2
V	1,523	—	1	—	—	—	—	—	1,524
VI	10	2	4	2	—	—	—	—	18
VII	—	—	—	—	1	—	—	—	1
VIII	—	—	—	—	—	1	—	—	1
IX	—	—	—	—	—	—	2	—	2
XI	—	—	—	—	—	—	—	1	1
Total	1,536	2	5	2	1	1	2	1	1,550

Correlation of the number of stamens and corolla in the same flower is shown in Table VII.

TABLE VII

No. of corolla	No. of Stamens								Total
	X	XI	XII	XIII	XIV	XVI	XVIII	XX	
IV	1	—	—	—	—	—	—	—	1
V	1,524	1	—	—	1	—	—	—	1,526
VI	10	1	5	2	—	—	—	—	18
VII	1	—	—	—	—	—	—	—	1
VIII	—	—	—	—	—	1	—	—	1
IX	—	—	—	—	—	—	2	—	2
XI	—	—	—	—	—	—	—	1	1
Total	1,536	2	5	2	1	1	2	1	1,550

Variation in the floral parts are recorded in *Primula* by Hill (1902); in *Jasminum malabaricum* Wight, by Mann (1920); in *Phlox Drummondii* Hook, by Singh and Sinha (1928); *in Mangifera indica* Linn. by Singh (1935); and in *Rondeletia odorata* Jacq. by Cooper (1937).

From the Tables II to IV it is very clear that the 29 flowers shown in Table I are to be considered as abnormal flowers. Various types of abnormalities in the flowers of *Quisqualis indica* Linn. are recorded by Rao (1935) and Singh (1926, 1935). Of the 15 different types of abnormalities given in Table I, some have been already recorded by Singh (1926, 1935). They are petaloidy of sepals, fasciation of flowers, hexamerous symmetry of chloresis of petal.

Abnormalities mentioned in this note differ from those already recorded in : (1) the unequal number of sepals, petals and stamens ; (2) larger number of petaloid sepals than one ; (3) octamerous flowers ; (4) absence of decamerous fasciated flowers ; and (5) 20 stamens instead of 22 stamens, in a fasciated flower with 11 calyx-teeth and petals

SUMMARY.

In all, 1,550 flowers of *Quisqualis indica* Linn. were examined to study variation in the floral parts. 29 flowers, *i. e.*, 1.87% showed variation in the number of calyx-teeth, petals and stamens. Ovary was normal in all cases except in the case of a fasciated flower, in which it was bilocular. These 29 flowers showed 15 different types of abnormalities. Only those not recorded heretofore are recorded in this note.

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NOTES ON THE *CONVOLVULACEAE* OF BOMBAY

BY

H. SANTAPAU, S.J., F.L.S.

Whilst checking the *Convolvulaceae* of my Khandala collections with the types at Kew Herbarium, and going through the pertinent literature on the family, I gathered a fair number of notes that may very well serve towards the revision of the family at least as far as Bombay Province is concerned; this I consider the more necessary as Blatter on account of his untimely death in 1934 could not carry out his plans of a complete revision of the plants of Bombay. In the hope that these notes may prove of interest to other botanists in India, I hasten their publication.

One of the most striking features of the family *Convolvulaceae* is the very "fluid" state of the boundaries or limits separating adjoining genera. This is particularly the case with the genera *Merremia* Dennst., *Convolvulus* Linn., *Ipomoea* Linn., *Argyreia* Lour., *Lettsomia* Roxb., *Calonyction* Choisy, etc. In point of fact, the arrangement of many of these genera in Kew Herbarium obviates the difficulty by grouping together such genera as *Ipomoea*, *Operculina*, *Calonyction*, *Aniseia*, etc. under the genus *Ipomoea*. The difficulties in separating the genera are such that some of the Kew botanists, seriously or otherwise, have suggested as a practical working idea the grouping together of most of the *Convolvulaceae* under *Ipomoea* and *Convolvulus*, as Linn. did in his Species Plantarum. It is interesting to note that Bentham and Hooker in Gen. Plant. have fused *Calonyction*, *Quamoclit*, *Operculina*, *Aniseia*, *Batatas* and *Ipomoea* proper under the genus *Ipomoea*.

From the point of view of the practical systematist, the result of this confusion is that there is scarcely a genus of the Indian *Convolvulaceae* that has not been placed at one time or another under a number of different genera. Such a procedure naturally complicates the problems of nomenclature almost to the limit of endurance for the poor systematist who attempts to work at the *Convolvulaceae*. In the following pages, I have followed the treatment of van Ooststroom, who in recent years has produced an up-to-date monograph of the family, at least as far as India and South-East Asia are concerned. For a comprehensive list of the most important references, the reader is referred to the bibliography at the end of this paper. For purposes of ready reference and comparison, I have attempted to follow the same order of genera and species as Cooke in his Flora ; it is not my intention nor my claim to have produced a complete revision of the family, as I have left out almost entirely such plants as are found to occur exclusively in Sind, since both politically and ecologically Sind can scarcely be called a part of the Province of Bombay.

To give a complete list of synonyms is beyond the scope of this paper, and would take too much unnecessary space ; all those synonyms, however, are given which in any way affect the present name of the plant. References are also given to the most important books or papers on each subject, and among such important books, I include those especially written on the plants of Bombay. As far as possible I have also tried to give a reference to Gamble's *Flora of the Presidency of Madras*, for although this is not the latest, in my opinion it is the most critical of Indian Floras ; as a proof of the careful study with which Gamble prepared his Flora one has but to examine the Madras sheets in Kew Herbarium, many of which show detailed dissections or diagrams or both made by Gamble whilst preparing his book. Merrill's *Enumeration of Philippine Flowering Plants* and other works by the same author are also quoted on numerous occasions, on account of the importance of Merrill's critical studies on the subject of plant nomenclature. In every case I have checked the references given and have satisfied myself of their accuracy. Finally I have tried to give a reference to a good illustration of the plant in question, those books being preferably quoted which are more easily available to Indian students.

It will not be out of place in conclusion to insert here a few sentences with which Choisy concludes the introduction to the *Convolvulaceae* in DC. Prodr. 9 : 324, 1845 : "A most unhappily intricate order as regards the distinction of genera and the synonymy of the species . . . In consequence we exhort and pray the diligent reader not to give up the work of revising his *Convolvulaceae*, and in particular not to cut the Gordian knot easily by creating new species and proposing new names which may render the already obscure synonymy even more obscure ; moreover, if he does not find his plant among the *Ipomoeas*, to look for it among the *Argyreias* or *Jacquemontias;* perhaps he will be luckier than ourselves, and may even correct our mistakes."

2. **CUSCUTA** Linn.

Corolla twice as long as the calyx or longer..........	*C. reflexa*.
Corolla less than twice as long as the calyx :	
Scales at the base of corolla tube O............	*C. hyalina*.
Scales at base of corolla tube present and fimbriate..	*C. chinensis*.

Cuscuta reflexa Roxb., Pl. Cor. 2 : 3, t. 104, 1798 ; Fl. Ind. 1 : 446, 1832 ; Clarke, 225 ; Graham, 134 ; Choisy, in Mem. Soc. Phys. Hist. Nat. Geneve, 9 : 273, 1841 ; Englemann, 518 ; Bot. Mag. 37 : t. 6566, 1881 ; Cooke, 224 ; Hall. f. in Engler, Bot. Jahrb. 49 : 375, 1813 ; Yuncker, 259, f. 130, A-F ; van Ooststroom, in Blumea 3 : 70-72, 1938 (non Decaisne).

The main difference between this *Cuscuta* and the following species, according to Yuncker, is in the length of the corolla tube, which in *C. reflexa* is about three times as long as the calyx, whilst in the other two species it is scarcely longer than the calyx.

Cuscuta hyalina Roth, Nov. Pl. Sp. 100, 1821 ; Clarke, 226 ; Choisy, 286 ; Englemann, 490 ; Cooke, 225 ; Yuncker, 235, f. 107 A-D. (non Wight, nec Boiss.).

Cuscuta arabica Wight, Icon. t. 1371, 1850 (non Fresen.).

Cuscuta Boissieri Stocks, in Hook. Journ. Bot. 4 : 173, 1852.

Cuscuta chinensis Lamk. in Encycl. Meth. 2 : 229, 1786 ; Clarke, 226 ; Choisy, 279 ; Wight, Icon. t. 1373 ; Englemann, 479 ; Cooke, 225 ; Yuncker, 209, f. 80 A-G.

Cuscuta sulcata Roxb., Hort. Beng. 12, 1814 ; Fl. Ind. 1 : 477, 1820 (non Wall.).

Cuscuta hyalina Wight, Icon. t. 1372 ; Illustr. 2 : t. 168, f. 12, 1850 (non Roth).

2. ERYCIBE Roxb.

Following Gamble, I have separated the variety *wightiana* Clarke and restored it to specific rank. The differences between the two species are given in the following key adapted from Gamble, *Flor. Pres., Madr.* p. 930 :

Corolla yellowish, leaves elliptic-oblong or obovate, abruptly and sharply acuminate ; base attenuate, up to 12.5 cms. long, 5 cms. broad, the petiole 8-13 mm. long ; cymes axillary or in terminal panicles ; berry 13 mm. long, ellipsoid........	1. *E. paniculata.*
Corolla white ; leaves elliptic or obovate, sometimes almost orbicular, sometimes even lanceolate, abruptly and usually obtusely acuminate, base cuneate or rounded, up to 10.2 cms. long, 5 cms. broad, the petioles 6.5 mm. long, cymes axillary and elongate or in terminal panicles ; berry 13 mm. long, ovoid................................	2. *E. wightiana.*

Erycibe paniculata Roxb., Pl. Cor. 2 : 31, t. 159, 1798 ; Clarke, 180 ; Graham, 137 ; Dalz. and Gibs. 169 ; Wight, Illust. t. 180 ; Peter, 21, f. 10 E-F ; Cooke, 225.

Erycibe wightiana Graham, 137 ; Hall. f. in Bull. Herb. Boiss. 5 : 737, 1897 ; Gamble, 930.

Erycibe paniculata var. *wightiana* Clarke, in Hook. f. Fl. Brit. Ind. 4 : 181, 1883 ; Cooke, 226.

3. PORANA Burm.

Merrill in his Enum. Phil. Fl. Pl. 3 : 358, 1923 and elsewhere, spells the generic name as *Porania;* van Ooststroom in his mongraph and all other authors consulted spell it as *Porana ;* Burmann in his *Flora Indica* 51, t. 21, f. 1, spells it also as *Porana.* I have failed to find the reason for Merrill's departure from the accepted spelling.

Calyx much enlarged in fruit....................	*P. malabarica.*
Calyx not or scarcely enlarged in fruit..............	*P. paniculata.*

Porana malabarica Clarke in Hook. f. Fl. Brit. Ind. 4 : 223, 1883 ; Peter, 24, f. 11C ; Cooke, 227 ;

Porana racemosa Graham, 133 ; Dalz. and Gibs. 162 (non Roxb.).

Porana paniculata Roxb., Pl. Cor. 3: 31, t. 235, 1819 ; Clarke, 222 ; Choisy, 6 : 189, 1833 ; Cooke, 227 ; van Ooststroom in Blumea 3 : 93, 1938.

4. NEUROPELTIS Wall.

Van Ooststroom in Blumea, 5 : 268-73, 1942, has placed the plants of Western India under a new specific name, the plants being quite distinct from *N. racemosa* Wall. The following key is based on that of van Ooststroom and is given here as a help to distinguish the two species of *Neuropeltis* ; *N. racemosa* Wall. does not occur in the western parts of India.

Corolla tube inside hairy at the base of the filaments. Styles as long as or shorter than the breadth of the stigma. Tenasserim, N. W. part of the Malay Peninsula....................................	*N. racemosa* Wall.
Corolla tube inside glabrous at the base of the filaments. Styles much longer than the breadth of the stigma. British India (Deccan Peninsula)..	*N. malabarica* Oostst.

Neuropeltis malabarica van Ooststroom in Blumea loc. cit.

Neuropeltis racemosa auct. plur. (non Wall.)

For a description of the plant, see van Ooststroom, loc. cit. This new species is quite clearly different from *N. racemosa* Wall. ; the styles are only about as long as or even shorter than the width of the stigma, the whole of style and stigma being very short and included in the lower part of the corolla, the filaments are hairy at the base with a conspicuous tuft of hairs ; whilst in *N. racemosa* Wall. the long style makes the stigma almost exserted, or at least forces it up to nearly the top of the corolla, the filaments being quite glabrous at the base.

5. CRESSA Linn.

A common and widely distributed plant ; specimens found on either side of the Mediterranean shores are remarkably similar to the Indian specimens. Prostrate, erect or suberect shrubby plant. For the nomenclature of this species, see Cooke, 228.

6. EVOLVULUS Linn.

Erect or suberect, but not rooting at the nodes......	*E. alsinoides.*
Prostrate and rooting at the nodes................	*E. nummularius.*

Evolvulus alsinoides Linn., Sp. Pl. 392, 1762 ; Clarke, 220 ; Wight, Illustr. t. 168 bis ; Hall. f. in Engler, Bot. Jahrb. 18 : 85, 1894 ;

Cooke, 229; Gamble, 923; van Ooststroom in Mon. Gen. Evolv. 26, 1934.
Convolvulus alsinoides Linn., Sp. Pl. 157, 1753.
Evolvulus hirsutus Graham, 133; Dalz. and Gibs. 162.

" The forms on which Linnaeus based this species is the common British India form spread throughout S.E. Asia." van Ooststroom, loc. cit.

Evolvulus nummularius Linn., Sp. Pl. 391, 1762; Jacq., Sel. Stirp. Amer. t. 260, f. 23, 1780; Choisy, 8: 72, 1838; Hall. f. in Engler, Bot. Jahrb. 18: 85, 1894; van Ooststroom in Mon. Gen. Evolv. 114, 1934.
Convolvulus nummularius Linn., Sp. Pl. 157, 1753.
Evolvulus alsinoides Jackson, in Ind. Kew. 1 : 940, 1893 (non Linn.).

This is a new record for the Province of Bombay, and is not mentioned by Cooke. In the city of Bombay it is common in lawns (Santapau 8042—8046 !); Thirumalachar sent me some specimens collected by him in Bangalore; Mayuranathan reports its presence in Madras city; van Ooststroom gives the following localities from which the plant has been collected: Calcutta, Howrah, Sibpur Botanic Gardens, Hughly District, Bardwan, Motahari in Behar, Benares Hindu University, etc.

E. nummularius is an American plant, native of from Mexico to N. Argentine, and the West Indies; it is also found in tropical Africa and Madagascar, and seems to be gradually spreading in India. The following description is taken from van Ooststroom loc. cit. pp. 115-116:

" A perennial herb. Stems several prostrate, rooting at the nodes, simple or slightly branched, slender, terete, pilose with short, patent, curved hairs, glabrescent, often lignescent at the base, variable in length, 10-40 cms. long; internodes 5-12 mm. sometimes to 20 mm. long. Leaves distichous, shortly petioled; petiole grooved above, pilose or glabrous, 1-5 mm. long, occasionally to 12 mm.; limb broad-ovate, elliptic or orbicular, sometimes obovate or oblong, rounded or emarginate at the apex, rounded, truncate or subcordate, sometimes slightly oblique at the base, variable in size, middle-sized leaves 4-15 mm. long, 3-15 mm. broad, larger ones up to 25 mm. long and 18 mm. broad, glabrous on both sides or sparsely appressed-pilose beneath especially on the nerves, sometimes also above, the margins sometimes ciliate, especially near the base, midrib and 2-5 pairs of lateral nerves more or less distinct beneath. Flowers 1 or 2 in the leaf-axils, on the main stems or on short lateral branches peduncles none or very short, rarely longer, up to 10 mm. long (f. pedunculatus); pedicels 2-6 mm. long, occasionally longer, recurved in fruit; bracteoles linear or lanceolate, acute, 0.5 -1.5 mm. long. Sepals equal, 2.5-4 mm. long, ovate-oblong, obtuse or acutish, minutely mucronate with microscopic pellucid dots, sparsely pilose or glabrous, but with ciliate margin; with distinct midrib and reticulate nervation; often reflexed in fruit. Corolla white, rarely pale blue, rotate to broadly funnel-shaped, 5-7 mm. long, the tube short, the limb about 8 mm. in diam., 5-lobed, the lobes distinct, sparsely pilose bands. Filaments inserted about 2 mm. above the corolla base, 2-3 times as long as the oblong anthers. Ovary globular, glabrous. Capsule globular, as long as or a little longer than the sepals, 2-celled, 4-valved, 4- or less-seeded."

7. BONAMIA Thouars.

Asa Gray in the Proc. Amer. Acad. 5 : 337, 1862, suggested the fusion of the genus *Breweria* with *Bonamia*, the older name *Bonamia* being retained for the combined genus. Benth. and Hook. in Gen. Plant. 2 : 877, did not accept the fusion ; Peter in Engl. and Prantl, Pflanzenfamilien, Jackson in Index Kew., Cooke in his Flora follow Benth. and Hooker in keeping the two genera separate. Hallier f., Merrill and van Ooststroom follow Asa Gray in fusing the two genera. On the other hand Benth. and Hooker make *Seddera* Hochst. a section of *Breweria*, whilst O. Kuntze in Rev. Gen. Pl. places all the species of *Seddera* under *Convolvulus*. I have followed van Ooststroom in uniting *Breweria* and *Seddera* under *Bonamia* Thouars.

Bonamia semidigyna (Roxb.) Hall. f. in Engler, Bot. Jahrb. 16 : 528, 1893, et 18 : 9, 1894 excl. syn. Breweria abscissa Choisy ; id. in Bull. Herb. Boiss. 5 : 382, 814, t. 15, 1897 ; Merrill, 357 ; van Ooststroom in Blumea 3 : 76, 1938.

Convolvulus semidigynus Roxb. Hort. Beng. 13, 1814 ; Fl. Ind. 2 : 47, 1824 et 1 : 468, 1832.

Breweria cordata Blum., Bijdr. 722, 1825 ; Choisy, 6 : 493, 1844 ; Clarke, 223 ; Cooke, 230.

Breweria semidigyna O. Kuntze, Rev. Gen. Pl. 440, 1891 (Brewera)

Breweria Roxburghii Choisy, 493 ; Wight, Icon. 1370.

Bonamia latifolia (Hochst. et Steud.) Santapau, comb. nov.

Seddera latifolia Hochst. et Steud. in Flora 27, Bes. Beibl. 8, t. 5 B-C, 1844.

Breweria latifolia Benth. ex C. B. Clarke, in Hook. f. Fl. Brit. Ind. 4 : 224, 1883 ; Cooke, 230.

8. SHUTEREIA Choisy.

Van Ooststroom in Blumea 3 : 287, 1939, writes that in recent literature one finds generally the name *Hewittia* Wight et Arn. (1837) for this genus ; there is however an older name, *Shutereia* Choisy (1833) and in consequence the older name has been adopted by van Ooststroom ; this has necessitated the altering of *Shuteria* Wight et Arn. a name of a genus in the *Leguminosae*. This procedure is in accordance with the latest edition of the International Rules of Botanical Nomenclature, Art. 16, but the fact that the name *Hewittia* has been generally used up to the present and the necessary change in the *Leguminosae*, if Choisy's name be adopted, are reasons for the inclusion of *Hewittia* among the *Nomina Conservanda ;* until this is done, however, the name for the genus must be *Shutereia* Choisy.

Shutereia sublobata (Linn. f.) House in Bull. Torr. Bot. Club, 33 : 318, 1906 ; van Ooststroom in Blumea 3 : 287, 1939.

Convolvulus sublobatus Linn. f., Suppl. 135, 1781.

Convolvulus bicolor Vahl, Symb. 3 : 25, 1794 ; Bot. Mag. t. 2205.

Shutereia bicolor Choisy, 6 : 486, t. 2, f. 11, 1833.

Hewittia bicolor Wight et Arn. in Madr. Journ. Lit. and Sci. 5 : 22, 1837 ; Clarke, 216 ; Wight, Icon. t. 835 ; Peter, 25, f. 12 B ; Hall. f. in Bull. Herb. Boiss. 5 : 379-380, 1897 ; Cooke, 231 ; Merill, in Phil. Journ. Sci., 1 (Suppl.) : 120, 1906 ; Gamble, 924.

Hewittia sublobata O. Kuntze, Rev. Gen. Pl. 441, 1891 ; Merrill, 359.

9. ANISEIA Choisy.

Aniseia martinicensis (Jacq.) Choisy, 8 : 66, 1838 ; Hall. f. in Engler, Bot. Jahrb. 18 : 96, 1894, et in Bull. Herb. Boiss. (ser. 2, 1 : 674, 1901 ; Merrill, 359 ; van Ooststroom in Blumea 3 : 280, 1939.

Convolvulus martinicensis Jacq., Select. Stirp. Amer. 26, t. 17, 1763.
Convolvulus uniflorus Burm., Fl. Ind., 47, t. 21, f. 2, 1768.
Aniseia uniflora Choisy, 6 : 483, t. 2, f. 9, 1833 ; Wight, Icon. t. 850 ; Graham, 133 ; Dalz. and Gibs., 163 ; Peter, 25, f. 12 A., 1897 ; Cooke, 231.
Ipomoea uniflora R. et Schult., Syst. Veg., 4 : 247, 1819 ; Clarke, 201 (non Blume).

10. CONVOLVULUS Linn.

Erect, shrubby plant ; corolla small, blue..........	*C. Rottlerianus.*
Prostrate or twining herb ; corolla about 2.5 cms. long, and about as much in diam., pink or white with pink stripes..................................	*C. arvensis.*

Convolvulus arvensis Linn., Sp. Pl. 153, 1753 ; Clarke, 219 ; Choisy, 479 ; Graham, 132 ; Dalz. and Gibs., 163 ; Hall. f. in Engler, Bot. Jahrb. 18 : 108, 1894 ; Cooke, 234 ; Gamble, 925 ; van Ooststroom in Blumea 3 : 283, 1939.

Convolvulus Rottlerianus Choisy, 6 : 477, 1833 ; Clarke, 219 ; Dalz. and Gibs. 164 ; Cooke, 233.

11. JACQUEMONTIA Choisy.

Jacquemontia paniculata (Burm. f.) Hall. f. in Engler Bot. Jahrb. 16 : 541, 1893 ; Cooke, 235 ; Merrill, 359 ; Gamble, 926 ; van Ooststroom in Blumea 3 : 269, 1939.

Ipomoea paniculata Burm. f., Fl. Ind. 50, t. 21, f. 3, 1768.
Convolvulus parviflorus Vahl, Symb. 3 : 29, 1794 ; Clarke, 220 (non Dalz., nec Desr.).

12. MERREMIA Dennst.

Leaves entire :	
Leaves reniform, usually broader than long, 12-25 mm. broad......................	*M. emarginata.*
Leaves not reniform, longer than broad :	
Seeds pubescent or hairy :	
Seeds hairy with long hairs..........	*M. umbellata.*
Seeds with fulvous velvety pubescence..	*M. hederacea.*
Seeds glabrous :	
Many or all the leaves 3-lobed or 3-toothed at the apex..............	*M. tridentata.*
Leaves not 3-toothed at the apex ; base auriculate dentate................	*M.* hastata.

Leaves 5-7-partite or lobed :
- Corolla yellow ; leaves palmately divided :
  - Stems glabrous ; leaves palmately cut nearly to the base........................ *M. rhyncorhiza.*
  - Stems with long spreading deciduous hairs ; leaves divided to less than half of the way down.......................... *M. vitifolia.*
- Corolla white ; leaves digitately divided ; stems with long deciduous hairs from bulbous bases.................................. *M. aegyptia.*

Merremia emarginata (Burm. f.) Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893 ; Cooke, 236 ; Gamble, 928 ; Merrill, 360 ; van Ooststroom in Blumea, 3 : 312, 1939.

Evolvulus emarginatus Burm. f., Fl. Ind. 77, t. 30, f. 1, 1768.

Convolvulus reniformis Roxb., Fl. Ind. 2 : 67, 1824 ; et 1 : 481, 1832.

Ipomoea reniformis Choisy, 6 : 446, 1833 ; Clarke, 206 ; Graham, 131 ; Dalz. and Gibs., 164.

Ipomoea emarginata O. Kuntze, Rev. Gen. Pl., 444, 1891.

Merremia umbellata (Linn.) Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893 ; Cooke, 237 ; Gamble, 928 ; Merrill, 362 ; van Ooststroom in Blumea 3 : 333, 1939.

Convolvulus umbellatus Linn., Sp. Pl. 155, 1753 ; Wall., Cat. 2329.

Convolvulus cymosus Desr. in Lamk. Encycl. Meth. 3 : 556, 1791.

Ipomoea cymosa R. et Schult., Syst. 4 : 241, 1819 ; Choisy, 6 : 461, 1833 ; Clarke, 211.

Merremia cymosa Baker et Rendle, in This.-Dyer, Fl. Trop. Afr. 4(2) : 106, 1905.

Examination of large numbers of specimens both in the field and in Herb. Kew. has convinced me of the correctness of Cooke's remark that the corolla is lineate, against the statement of Hallier f. in Engler, Bot. Jahrb. 18 : 133, that the corolla is never or very rarely lineate.

Merremia tridentata (Linn.) Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893 ; Cooke. 237 ; Gamble, 928 ; van Ooststroom in Blumea 3 : 315, 1939.

Convolvulus tridentatus Linn., Sp. Pl. 157, 1753.

Evolvulus tridentatus Linn., Sp. Pl. 392, 1762.

Ipomoea tridentata Roth in R. et Schult., Arch. Bot. 1(3) : 38, 1798 ; Clarke, 205 ; Choisy, 447 ; Graham, 131 ; Dalz. and Gibs. 165.

Merremia hastata (Desr.) Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893 ; Cooke, 238 ; Gamble, 929 ; Merrill, 361.

Convolvulus hastatus Desr. in Lamk. Encycl. Meth. 3 : 542, 1789 (non Sieb., nec Thunb., nec Forsk.).

Convolvulus simplex Pers., Syn. 1 : 178, 1805 (non Spreng.).

Ipomoea denticulata R. Br., Prodr., 485, 1810 ; Bot. Reg. t. 317, 1818 ; (non Choisy).

Convolvulus denticulatus Spreng., Syst. 1 : 603, 1825.

Merremia tridentata subs. *hastata* van Oostst. in Blumea 3 : 317, 1939.

Merremia hastata Hall. f. has leaves which differ from those of *M. tridentata* in size and shape ; the peduncles in *M. hastata* are much longer, the sepals and corolla much larger, the capsules much bigger.

For these reasons I am inclined to retain *M. hastata* as a separate species, against van Ooststroom, who makes of *M. hastata* but a subspecies of *M. tridentata.*

Merremia hederacea (Burm. f.) Hall. f. in Engler, Bot. Jahrb. 18 : 118, 1894; Merrill, 361; van Ooststroom in Blumea 3 : 302, 1939.
Evolvulus hederaceus Burm. f., Fl. Ind. 77, t. 30, f. 2, 1768.
Ipomoea chryseides Ker-Gawl. in Bot. t. 270, 1818; Choisy, 469; Clarke, 206; Wight, Icon. t. 157; Dalz. and Gibs., 166.
Merremia chryseides Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893; Cooke, 238; Gamble, 929.

Merremia rhyncorhiza Dalz. in Kew Journ. Bot. 3 : 179, 1851:
Ipomoea rhyncorhiza Dalz. in Kew Journ. Bot. 3 : 179, 1851; Clarke, 214; Dalz. and Gibs., 167.

Merremia vitifolia (Burm. f.) Hall. f. in Engler, Bot. Jahrb. 16 ; 552, 1893; Cooke, 239; Gamble, 928; Merrill, 362; van Ooststroom in Blumea 3 : 329, 1939.
Convolvulus vitifolius Burm. f., Fl. Ind., 45,t. 18, f. 1, 1766.
Ipomoea vitifolia Blume, Bijdr. 709, 1825; Choisy, 454; Clarke, 213; Graham, 132; Dalz. and Gibs. 165.

Merremia aegyptia (Linn.) Urb., Symb. Antill. 4 : 505, 1910 Gamble, 928; van Ooststroom in Blumea 3 : 327, 1939.
Ipomoea aegyptia Linn., Sp. Pl. 162.
Convolvulus pentaphyllus Linn., Sp. Pl. 223, 1762.
Ipomoea pentaphylla Jacq., Collect. 2 : 287, 1788; Clarke, 202.
Merremia pentaphylla Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893; Cooke, 239.
Batatas pentaphylla Choisy, 6 : 436, 1833; Graham, 129; Dalz. and Gibs., 167.

Merremia dissecta (Jacq.) Hall. f. in Engler, Bot. Jahrb. 16 : 552, 1893; Cooke, 240; Gamble, 928.
Convolvulus dissectus Jacq., Obs. 2 : 4, 1761.
Ipomoea dissecta Pers. in Linn. Syst. (ed. 15), in nota, 1795 (non Linn.).
Ipomoea sinuata Ortega, Hort. Matr. Decad. 7 : 74, 1798; Clarke 214; Graham, 132; Dalz. and Gibs., Suppl. 59.

Merremia tuberosa (Linn.) Rendle, in This.-Dyer, Fl. Trop. Afr. 4(2) : 104, 1905; van Ooststroom, in Blumea 3 : 325, 1939.
Ipomoea tuberosa Linn., Sp. Pl. 160; Choisy, 452; Cooke, 251 (non Lour.).
Convolvulus tuberosus Spreng., Syst. 1 : 591, 1825 (non Willd.)
Operculina tuberosa Meissn. in Mart. Fl. Bras. 7 : 212, 1869; Hall. f. in Engler, Bot. Jahrb. 16 : 476, 549, 1893; Merrill, 363.
Ipomoea nuda Peter, 31.

13. OPERCULINA Silva Manso.

Operculina Turpethum (Linn.) Silva Manso, Enum. Subs. Braz. 16 et 49, 1836; Hall. f. in Engler, Bot. Jahrb. 18 : 120, 1894; Cooke, 240; Gamble, 929; Merrill, 363; van Ooststroom in Blumea 3 : 362, 1939.

Convolvulus Turpethum Linn., Sp. Pl. 155 ; Bot. Mag. t. 2093.
Ipomoea Turpethum R. Br., Prodr. 485, 1810 ; Choisy, 450 ; Bot. Reg. 279 ; Clarke, 212 ; Graham, 131 ; Dalz. and Gibs. 165.

14. IPOMOEA Linn.

Ipomoea calycina (Choisy) Clarke, in Hook. f. Fl. Brit. Ind. 4 : 201, 1883 ; Cooke. 242 ; Gamble,
Aniseia calycina Choisy, 6 : 482, 1833 ; Graham, 250 ; Wight, Icon. t. 833 ; Dalz. and Gibs. 163.

Ipomoea barlerioides (Choisy) Benth. et Hook. f., Gen. Pl. 2 : 872, 1876 ; Clarke, 201 ; Cooke, 243.
Aniseia barlerioides Choisy, 6 : 484, 1833.

Ipomoea hispida (Vahl) R. et Schult., Syst. 4 : 238, 1819 ; Hall. f. in Engler, Bot. Jahrb. 18 : 123, 1893 ; Gamble, 915 ; Merill, 366 ; van Ooststroom in Blumea 3 : 490, 1940.
Convolvulus hispidus Vahl, Symb. 3 : 29, 1794.
Ipomoea eriocarpa R. Br., Prodr. 484, 1810 ; Clarke, 204 ; Cooke, 243.
Ipomoea sessiliflora Roth, Nov. Pl. Sp. 116, 1821 ; Wight, Icon. t. 169 ; Galz. and Gibs., 166.

Ipomoea pileata Roxb., Fl. Ind. 2 : 94, 1824 ; et 1 : 504, 1832 ; Clarke, 203 ; Choisy, 456 ; Gamble, 916 ; van Ooststroom in Blumea 3 : 507, 1940.
Ipomoea involucrata Cooke, 245 (non Beauv.).

" Several authors have considered this species as being identical with the African *Ipomoea involucrata* Beauv., and have mentioned it under that name. Baker and Rendle, in Thiselton-Dyer, Flora of Tropical Africa iv, 2 : 150-151, 1905, have rightly distinguished both as being two different species." (van Ooststroom, in Blumea 3 : 509, 1940). *I. involucrata* Beauv. does not occur in Bombay Presidency.

Ipomoea Clarkei Hook. f. in Fl. Brit. Ind. 4 : 734, 1885 (in Add. et Corr.) ; Cooke, 245.
Ipomoea Stocksii Clarke, 207 (per error. pro *I. Clarkei ;* non *I. Stocksii* Clarke, ibid. p. 204, 1883).

Apparently a very rare plant in the Province of Bombay ; I have collected it but on one occasion in Khandala (Santapau 5148 ! in Blatter Herb.) ; the flowers are of a fine light yellow, and the plant is a slender twiner growing among grasses on grassy slopes.

Ipomoea aquatica Forsk., Fl. Aeg.-arab., 44, 1775 ; Clarke, 210 ; Cooke, 246 ; van Ooststroom in Blumea 3 : 528, 1940.
Convolvulus repens Vahl, Symb. 1 : 17, 1790 (non Linn.).
Ipomoea reptans Poir. in Lamk., Encycl. Meth., Suppl. 3 : 460, 1814 ; Graham, 130 ; Dalz. and Gibs. 164 ; Hall. f. in Engler, Bot. Jahrb. 18 : 143, 1893 ; Gamble, 916 ; Merrill, 368 (non *Convolvulus reptans* Linn. ; cfr. Merrill, in Phil. Journ. Sci., 59 : 451-452, 1936).

Ipomoea maxima (Linn. f.) Don in Sweet, Hort. Brit. (ed. 2) 372, 1830 ; Hochreut. in Candollea, 5 : 186, 1934 ; van Ooststroom in Blumea 3 : 525, 1940.

Convolvulus maximus Linn. f., Suppl. 137, 1781.
Ipomoea sepiaria Koenig ex Roxb. Fl. Ind. 2 : 90, 1824, et 1 : 499, 1832 ; Clarke, 209 ; Choisy, 464 ; Graham, 131 ; Wight, Icon. t. 838 ; Dalz. and Gibs., 166.

Ipomoea staphylina R. et Schult., Syst., 4 : 249, 1819 ; Clarke, 210 ; Choisy, 460 ; Cooke, 247.
Ipomoea racemosa Roth, Nov. Pl. Sp. 115, 1821 ; Wight, Illustr. t. 168 (non Poir.).

Ipomoea soluta Kerr, in Kew Bull., 1941, 18.
Ipomoea campanulata Choisy, 6 : 451, 1833 ; Graham, 131 ; Dalz. and Gibs., 165 ; Clarke, 211 excl. var. *illustris* Clarke ; Cooke, 247 ; et alior. auct. (non Linn.)

Kerr loc. cit. has shown that *Ipomoea campanulata* Linn. Sp. Pl. 160, is actually not an *Ipomoea* at all, but *Thespesia populnea* (Linn.) Soland. This is a common plant in Khandala on the slopes near Forbay and on Battery Hill Plateau. In the young stages, branches often trail for long distances on the floor of the forest, and can be easily identified by the typical structure of the leaves : the lateral nerves are numerous and very conspicuous on the underside of the leaf, and come out nearly at right angles to the midrib and are almost parallel among themselves.

Ipomoea obscura (Linn.) Ker-Gawl., in Bot. Reg. t. 239, 1817 ; Clarke, 207 ; Choisy, 464 ; Graham, 131 ; Dalz. and Gibs. 166 ; Hall. f. in Engler, Bot. Jahrb. 18 : 140, 1893 ; Cooke, 248 ; Gamble, 916 ; Merrill, 366 ; van Ooststroom in Blumea 3 : 519, 1940.
Convolvulus obscurus Linn., Sp., Pl. 220, 1762.
Ipomoea solanifolia Burm. f., Fl. Ind., 49, 1768, et alior. auct. (non Linn.).

Ipomoea pes-caprae (Linn.) Sweet, Hort. Sub. Lond. 35, 1818 ; Choisy, 445 ; Graham, 130 ; Dalz. and Gibs., 164 ; Hall. f. in Engler, Bot. Jahrb. 18 : 145, 1893 ; Gamble, 917 ; Merrill, 366 ; van Ooststroom in Blumea 3 : 532, 1940 ;
Convolvulus pes-caprae Linn., Sp. Pl. 159 ; Roxb., Fl. Ind. 1 : 486, 1832.
Ipomoea biloba Forsk., Fl. Aeg.-arab., 44, 1775 ; Clarke, 212 ; Cooke, 248.

Ipomoea coptica (Linn.) Roth, apud R. et Schult., Syst. 4 : 208 1819 ; et in Nov. Pl. Sp. 110, 1821 ; Choisy, 471 ; Graham, 132 ; Dalz. and Gibs., 166 ; Hall. f. in Engler, Bot. Jahrb. 18 : 147, 1893 ; van Ooststroom in Blumea 3 : 544, 1940.
Convolvulus copticus Linn., Mant. II, Append. 559, 1771.
Ipomoea dissecta Willd., Phytogr. 5, t. 2, 1794 ; Clarke, 200 ; Cooke, 249.

Ipomoea digitata Linn., Syst. (ed. 10) 924, 1759 ; Clarke, 202 ; Cooke, 249 ; Merrill, 364 ; van Ooststroom in Blumea 3 : 558, 1940.
Convolvulus paniculatus Linn., Sp. Pl. 156.
Ipomoea paniculata R. Br., Prodr. 487, 1810 ; Hall. f. in Engler Bot. Jahrb. 18 : 149, 1893 ; Gamble, 918 ; (non Burm.).

Batatas paniculata Choisy, 6 : 436, 1833 ; Graham, 129 ; Dalz. and Gibs., 167.

Ipomoea diversifolia R. Br., Prodr. 487, 1810 ; Merrill, 365 ; van Ooststroom in Blumea 3 : 545, 1940.
Pharbitis laciniata Dalz. in Hook. Kew Journ. Bot., 3 : 178, 1851 ; Dalz. and Gibs., 167.
Ipomoea laciniata Clarke, 200 ; Cooke, 250.

Ipomoea cairica (Linn.) Sweet, Hort. Brit. 287, 1827 ; Hall. f. in Engler, Bot. Jahrb. 18 : 148, 1893 ; Gamble, 918 (excl. var. *I. pulchella* Roth) ; Merrill, 364 ; van Ooststroom in Blumea 3 : 542, 1940.
Convolvulus cairicus Linn., Syst. (ed. 10), 922, 1759.
Ipomoea palmata Forsk., Fl. Aeg.-arab. 43, 1775 ; Clarke, 214 ; Cooke, 250.
Ipomoea pulchella Wight, Icon. t. 156, (non Roth).

Ipomoea pes-tigridis Linn., Sp. Pl. 162 ; Clarke, 204 ; Graham, 132 ; Wight, Icon., t. 836 ; Dalz. and Gibs., 165 ; Hall. f. in Engler, Bot. Jahrb. 18 : 134, 1893 ; Cooke, 250 ; Gamble, 918 ; Merrill, 367 ; van Ooststroom in Blumea, 3 : 504, 1940.
Ipomoea hepaticifolia Linn., Sp. Pl. 161.
Ipomoea pes-tigridis Linn. var. *hepaticifolia* Clarke, 204.

Ipomoea Batatas (Linn.) Lamk., Tabl. Encycl. 1 : 465, 1791 ; Clarke, 202 ; Hall. f. in Engler, Bot. Jahrb. 18 : 138, 1893 ; Cooke, 251 ; Merrill, 364 ; van Ooststroom in Blumea 3 : 512, 1940.
Convolvulus Batatas Linn., Sp. Pl. 154.
Convolvulus edulis Choisy, 6 : 435, 1833.

Ipomoea Leari Paxt., Mag. Bot. 6 : 267, 1839 ; Cooke, 251 ; van Ooststroom in Blumea 3 : 502, 1940.
Pharbitis Leari Dalz. and Gibs., Suppl. 58.

" *I. Leari* Paxt. . . which is sometimes found in culture for ornamental purposes seems to be not or scarcely different from *I. congesta* R. Br." (van Ooststroom, loc. cit.). Examination of the specimens in Herb. Kew. shows that *I. Leari* Paxt. is also very similar to *I. hederacea* Jacq. and *I. Nil* Roth, from both of which it differs mainly on account of a more or less glabrous and slightly smaller calyx.

Ipomoea Nil (Linn.) Roth, Cat. Bot. 1 : 36, 1797 ; Hall. f. in Engler, Bot. Jahrb. 18 : 136, 1893 ; van Ooststroom in Blumea 3 : 497, 1940.
Convolvulus Nil Linn. Sp. Pl. (ed. 2) 219, 1762.
Ipomoea scabra Forsk., Fl. Aeg.-arab. 44, 1775.
Ipomoea hederacea auct. plur. (non Jacq.)

" Several authors have interpreted this species as being identical with the North American *Ipomoea hederacea* (Linn.) Jacq. (*Convolvulus hederaceus* Linn. Sp. Pl. ed. 1 (1753), p. 154, p. p. ; id. ed. 2 (1762), p. 219, p. p.) and have mentioned it under that name. . . The true *I. hederacea* is probably now and then cultivated in gardens. I did not see any specimens from Malaysia." (van Ooststroom, loc. cit.)

This is a common plant in Khandala, and from the range of its distribution in the district, I find it very difficult to accept the plant as an introduction and not a native in the western parts of India. I have always found, as regards Khandala, that introduced plants grew almost exclusively along the main road, or along the railway line, or if in the ravines, along the streams passing through the bottom of the ravines; no introduced plant has been found on top of the highest hills in the district; and yet this plant is abundant on the very highest parts of Bhoma hill, the highest spot about Khandala.

Ipomoea alba Linn., Sp. Pl. 161; Hall. f. in Meded. Rijks. Herb. Leiden, 1: 25, 1911; et 46: 19, 1922; van Ooststroom, in Blumea, 3: 547, 1940.
Convolvulus aculeatus Linn., Sp. Pl. 155.
Ipomoea bona-nox Linn., Sp. Pl. 228, 1762; Bot. Mag. t. 752; Clarke, 197.
Calonyction speciosum Choisy, 6: 441, t. 1, f. 4, 1833 (excl. var. 6); Cooke, 252;
Calonyction aculeatum House, in Bull. Torr. Bot. Club, 31: 590, 1904; Merrill, 369;
Calonyction Roxburghii G. Don, Gen. Syst. 4: 263, 1837; Graham, 130.

Ipomoea muricata (Linn.) Jacq., Hort. Schoenbr. 3: 40, t. 323, 1794 (non Cav.); Clarke, 197; van Ooststroom in Blumea, 3: 551, 1940.
Convolvulus muricatus Linn., Mant. 44, 1767.
Calonyction muricatum Don, Gen. Syst. 4: 264, 1838; Graham, 130; Hall. f. in Engler, Bot. Jahrb. 18: 154, 1893, et in Bull. Herb. Boiss. 5: 1044, 1897; Cooke, 253; Gamble, 920; Merrill, 370.

Ipomoea purpurea (Linn.) Roth, Bot. Abh. 27, 1787; Clarke, 200; Hall. f. in Engler, Bot. Jahrb. 18: 137, 1893; Cooke, 252; Merrill, 367; van Ooststroom in Blumea 3: 496, 1940.
Convolvulus purpureus Linn., Sp. Pl. 1: 219, 1762; Bot. Mag. t. 113.
Pharbitis hispida Choisy, 6: 438, 1833.
Pharbitis purpurea Voigt, Hort. Sub. Calcut. 354, 1845.

Ipomoea angulata Lamk. in Tabl. Encycl. 1: 464, 1791; van Ooststroom in Blumea 3: 553, 1940.
Ipomoea phoenicea Roxb., Fl. Ind. 2: 92, 1824, et 1: 502, 1832.
Quamoclit phoenicea Choisy, 6: 433, 1833; Gamble, 919; Merrill, 379.
Quamoclit coccinea Clarke, 199, et alior. plur. auct. (non Linn.).

Van Ooststroom, loc. cit., p. 555, following Hallier f. holds the view that the Indian plant is quite different from the North American *Ipomoea coccinea* Linn. Sp. Pl. 160 (*Quamoclit coccinea* Moench.). The differences between the two species can be seen in a note by Hall. f. in Bull. Herb. Boiss. 7: 415, 1899.

Ipomoea Quamoclit Linn. Sp. Pl. 159; Clarke, 199; Bot. Mag. t. 244; van Ooststroom in Blumea 3: 555, 1940.
Quamoclit vulgaris Choisy, 6: 434, 1833; Dalz. and Gibs., Suppl. 59; Cooke, 261.

Quamoclit pinnata Bojer, Hort. Maurit. 224, 1837; Hall. f. in Engler, Bot. Jahrb. 18 : 154, 1893; Gamble, 919; Merrill, 370.
Quamoclit Quamoclit Britton et Brown, Fl. North Unit. Stat. 3 22, 1898.

Ipomoea violacea Linn., Sp. Pl. 161; van Ooststroom in Blumea 3 : 541, 1940.
Ipomoea tricolor Cav., Icon. 3 : 5, t. 208, 1794.
Convolvulus violaceus Spreng., Syst. 1 : 599, 1825.
Ipomoea rubro-caerulea Hook., Bot. Mag. t. 3297, 1834; Cooke, 252.

15. RIVEA Choisy.

"It was Choisy, 1833, who established the genus *Rivea*, based on the species of *Lettsomia* with linear-oblong stigmas and with indehiscent dry fruit. In 1845 the very natural limits of *Rivea* became blurred, when he added several American species of *Ipomoea* to it, all with big lobular stigmas. Other authors, however, have maintained the original limits of the genus . . . In my opinion *Rivea* has to be brought back to its previous limits, as indicated by Choisy in 1833 and corresponding with Hallier's section *Eurivea* . . . The representatives of *Argyreia* are confined to tropical Asia, the Malay Archipelago and the Philippine Islands. *Rivea* only occurs in tropical Asia. *Legendrea* is of American origin with one representative also in the Canary Islands." (van Ooststroom in Blumea 5 : 354-355, 1943.) For the species of *Rivea* in Bombay and their nomenclature, see Cooke, 254; note, however, a correction for the date of Choisy's paper, which is 1833, and not 1834 as stated by Cooke.

16. ARGYREIA Lour.

The two genera *Argyreia* and *Lettsomia* have undergone considerable modifications almost from the time Loureiro erected the first genus in 1790. In his first edition of the *Flora Indica* in 1824, Roxburgh described the genus *Lettsomia* and listed under it a number of plants which subsequent authors have placed under *Argyreia*, *Lettsomia*, *Aniseia* or *Rivea*. Roxburgh based his new genus on the *Argyreias* with a two-celled ovary. In 1833 Choisy gave *Lettsomia* as a synonym of *Argyreia*, at least for the species with a campanulate corolla and bi-globular stigma; the other plants he placed under the new genus *Rivea*; "the genus *Rivea* is mainly distinct from *Argyreia* by its linear to oblong stigmas and from *Ipomoea* by the same character and the indehiscent instead of valvate fruit". (van Ooststroom, in Blumea 5 : 353, 1943.)

After the time of Choisy, authors seem somewhat undecided about the position of the two genera *Argyreia* and *Lettsomia*; all recognize that these genera are very closely related; Prain acknowledges that some of the species of *Lettsomia*, whose generic character is mainly a two-celled ovary, have a partial dissepiment at the base of the ovary, on account of which *Argyreia* and *Lettsomia* deserve to be reunited under one genus; but apparently Prain did not dare to effect such a fusion. Van Ooststroom, following Hallier f, has once more reunited the two genera into one, retaining the older name, *Argyreia*, for the combined genus. The reasons advanced by van Ooststroom for this fusion are the following: "In my opinion, *Argyreia* and *Lettsomia* can be combined without any difficulties under the name of the former genus. In keeping them apart, several species which are doubtless very nearly related should have to be inserted in different genera. The differences in the number of cells of the ovary appear of little value in several genera of the family *Convolvulaceae*. It was Hallier, 1893, who pointed this out already and the present author quite agrees with this opinion. Moreover, the species formerly inserted in *Lettsomia* have so many characters in common with those of *Argyreia* . . . that a separation of the genera would be a very unnatural one." (van Ooststroom loc. cit. p. 354.)

Argyreia nervosa (Burm. f.) Boj., Hort. Maurit. 224, 1837 ; Merrill, 371 ; van Ooststroom in Blumea 5 : 364, 1943.
Convolvulus nervosus Burm. f., Fl. Ind. 48, t. 20, f. 1, 1768.
Convolvulus speciosus Linn. f., Suppl. 137, 1781, excl. patria.
Ipomoea speciosa Pers., Syn. 1 : 183, 1805 ; Bot. Mag. t. 2446.
Lettsomia speciosa Roxb., Hort. Beng. 13, 1814.
Lettsomia nervosa Roxb., Fl. Ind., 2 : 289, 1824, et 1 : 488, 1832.
Argyreia speciosa Sweet, Hort. Brit. 289, 1827 ; Graham, 128 ; Dalz. and Gibs., 168 ; Wight, Icon. t. 851 ; Clarke, 185 ; Cooke, 255 ; Gamble, 907.
Rivea nervosa Hall. f. in Bull. Herb. Boiss. 5 : 381, 1897.

Argyreia aggregata (Roxb.) Choisy, 6 : 427, 1833 ; Graham, 128 ; Dalz. and Gibs., 169 ; van Ooststroom in Blumea 5 : 380, 1943.
Lettsomia aggregata Roxb., Hort. Beng. 13, 1814 ; Fl. Ind., 2 : 78, 1824, et 1 : 488, 1832 ; Clarke, 191 ; Wight, Icon. t. 1359 ; Cooke, 259 ; Gamble, 910.

Argyreia elliptica Choisy, 6 : 417, 1833 ; Graham, 128 ; Dalz. and Gibs., 169.
Lettsomia elliptica Wight, Icon. 4(2) : 12, 1850 ; Clarke, 192 ; Cooke, 259.

Argyreia setosa (Roxb.) Choisy, 6 : 425, 1833 ; Dalz. and Gibs., 168.
Lettsomia setosa Roxb., Hort. Beng. 13, 1814 ; Fl. Ind. 2 : 1824, et 1 : 490, 1832 ; Clarke, 194 ; Wight, Icon. t. 1360 ; Cooke, 260.

For the other species of *Argyreia* of Bombay, see Cooke 255-258.

17. LEGENDREA Webb.

Legendrea corymbosa var. **mollissima** (Webb et Berth.) van Ooststroom in Blumea 5 : 355, 1943, in nota.
Legendrea mollissima Webb et Berth., Hist. Nat. Can., 3 (pt. 2, sect. 3) : 27, t. 137, 1844 ; Cooke, 261.

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THE SYSTEMATIC POSITION OF THE FAMILY *MORINGACEAE* BASED ON THE STUDY OF *MORINGA PTERYGOSPERMA* GAERTN. (=*M. OLEIFERA* LAMK.).

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(*With 2 plates*)

The family *Moringaceae* has long been known to be of uncertain affinity. Following *Genera Plantarum* (1), Hooker (5) places it at the end of *Polypetalae* and remarks, 'A natural order of very doubtful affinity which has been referred to near *Resedaceae*, *Capparidaceae*, *Meliantheae*, *Violarieae*, *Polygalaceae*, *Leguminoseae*, *Bignoniaceae* (sic.) and others.'

Wettstein (10) as well as Engler and Diels (2) have placed it in the series Rhoeadales after the family *Resedaceae*. The former, however, admits that the family is of uncertain and doubtful affinity and says, 'Die stellung der familie, die jetzt zumeist hier angeschlossen wird, ist eine germassen unsicher. Morphologisch steht sie den Vorhergehenden nicht nahe. Das vorkommen kurzer Gynophor, von myrosin sowie das sero-diagnostiche verhalten (positive Reaktion mit Resedaceae und Capparidaceae, negative mit Cruciferae u. z. T. mit Papavaraceae) spricht etwas für eine verwandtschaft.'

Haines (4) places the family by itself in suborder 5. Moringineae of the Order Parietales of the Series Choripetalae between the suborder. 3. Flacourtineae (including the families *Flacourtiace*, *Violaceae*, *Turneraceae* and *Pittosporaceae*) and suborder. 4. Tamariscineae (including the family *Tamaricaceae*) on the one hand and suborder 6. Passiflorineae (including the families *Caricaceae*, *Passifloraceae*, *Cucurbitaceae* and *Begoniaceae*) on the other. This position, however, has been regarded as doubtful and he further states that these suborders in question have little in common with one another.

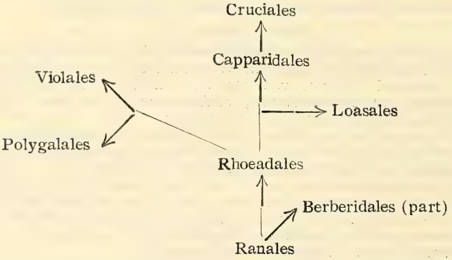
Hutchinson (6) places this family under Order No. 10 Capparidales after the family *Capparidaceae* and before the family *Tovariaceae*. The next Order No. 11 Cruciales contains the family *Cruciferae* followed by the Order No. 12 Violales containing the families *Violaceae* and *Resedaceae*.

Schnarf (9) after examination of the families in the Series No. 19 Rhoeadales states that the families *Papavaraceae*, *Tovariaceae*, *Cruciferae* and *Resedaceae* have common characters. No periplasmodium is formed in the anther-tapetum. The mature pollen grain is 2- or 3-nucleated and the ovule has thick nucellus and 2 integuments. The development of the embryo-sac is of the normal type. There may be differences in the formation of the female archesporium. *Papavaraceae* and *Tovariaceae* have primary archesporial cell, which cuts off wall cells while in *Resedaceae* and *Cruciferae* the tendency of the formation of wall cells is suppressed in course of the formation of the embryo-sac. With regard to the family *Moringaceae* he based his conclusions on the work of Rutgers (8) which he considers as doubtful. He has remarked at the end that the question whether *Moringaceae* can be put in the series Rhoeadales or not is not clear through the present statements and accounts. Rutgers' (8) work has been refuted by Puri (7), the important points of which are given as follows:—The archesporial cells, usually 1 but sometimes 2-3, divide in the usual manner to produce the primary wall cell and the megaspore mother cell. The former by repeated periclinal and anticlinal divisions forms 2–3, or even 4 layers of parietal tissue. Rutgers' (8) statement that the archesporial cell does not divide and functions directly as the embryo-sac mother cell seems to be incorrect. Both linear and T-shaped tetrad are observed but the latter type was only observed by Rutgers, The embryo-sac is monosporic 8-nucleated and not 5- nucleated as recorded by Rutgers (8).

Both Wettstein (10) and Hutchinson (6) have inferred the near relationship of *Moringaceae* with *Capparidaceae* from the presence of a short gynophore and parietal placentation. In the genus *Emblingia* of § Emblingioideae of the family *Capparidaceae* the calyx-tube is present according to Pax (referred to by Willis, 11) as is found in the *Moringaceae* but the carpels of *Capparidaceae* are typically *two*, syncarpous and transverse as in *Cruciferae*.

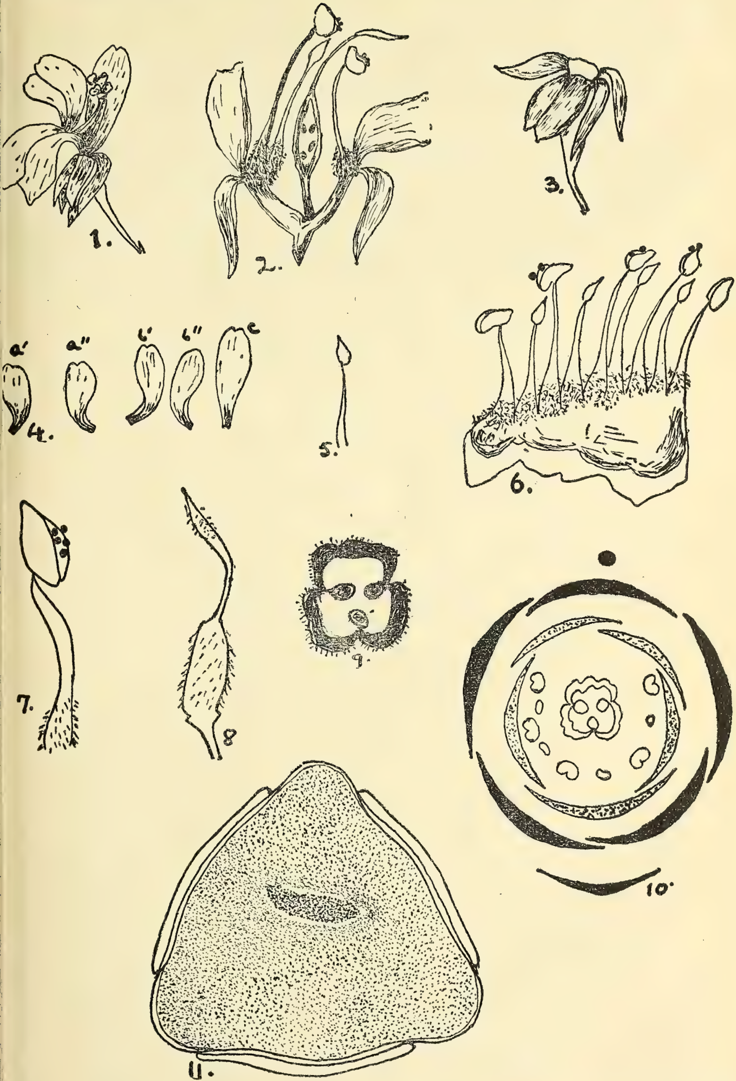
According to Engler and Diels (2) *Moringaceae* resembles *Resedaceae* in having parietal placentation and ex-albuminous seeds and capsular fruits. Instead of a short gynophore as in *Moringaceae* it is observed that the axis develops posteriorly into a large disc in *Resedaceae*. It differs markedly from *Resedaceae* in having 5-merous medianly zygomorphic flowers, the number of stamens and the straight embryo.

Hutchinson (6), however, has placed the family *Moringaceae* not far from the family *Violaceae*. His phylogenetic chart shows the probable course of evolution to have been as follows:—



Both the orders Violales and Capparidales are shown to have evolved from his Order No. 8 Rhoeadales and evidently they are nearly related.

A careful perusal of the relevant literature and the examination of the floral and other characters of *Moringa pterygosperma* Gaertn. = [*M. oleifera* (Lamk.)] (Figs. 1-11) reveals the fact that it is more closely allied to the family *Violaceae* and that it should be placed in the Order No. 12 Violales of Hutchinson (6). The reasons for holding the opinion are that the *Moringaceae* resembles the *Violaceae* in having medianly zygomorphic pentamerous flowers, the number of sepals and petals being five and the odd fifth petal being anterior and the largest in both of them. The aestivation of the sepals and the petals is also somewhat alike. The two lateral petals in species of *Viola* and *Moringa* have the same disposition (Fig. 10). Further, the two posterior petals are outermost in both the species. As regards the number of stamens, in *Moringa* the 5 perfect stamens alternate with the staminodes of the same number (3, 4 or 7) whereas in *Viola* staminodes are absent, although the number of stamens is 5. The embryo is straight in both the famliies. The ovary is tricarpellary and unilocular with parietal placentation in both the cases. In *Violaceae* the odd carpel is *anterior* whereas in *Moringaceae* it is *posterior* as in *Casearia* (Fam. *Flacourtiaceae* = *Samydaeeae* of Bentham and Hooker). In *Moringaceae* the seeds are invariably winged but Hutchinson (6) has also mentioned that in some species of Violaceae winged seeds have been found to occur. Endosperm-formation is nuclear (cf. Schnarf, 9) in *Violaceae* but in *Moringaceae* it is at first nuclear


1.
2.
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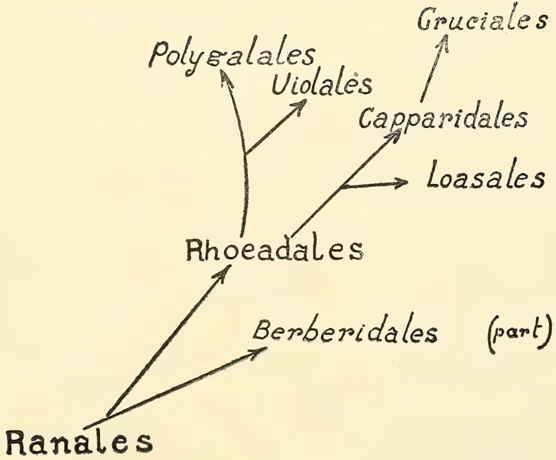
(*For explanation see end of article*)


Gruciales
Polygalales
Violales
Capparidales
Loasales
Rhoeadales
Berberidales (part)
Ranales

Moringaceae by R. M. Datta.

but cell-formation begins at a very late stage in the micropyle and is confined to that region. The cell-walls are indistinct and each 'cell' contains several nuclei according to Puri (7). With the maturity of the embryo the whole endosperm is used up and consequently the seed is non-endospermic in *Moringaceae* whereas in *Violaceae* a fleshy endosperm is present. In both *Violaceae* and *Moringaceae* the normal type of 8-nucleated embryo-sac occurs. The pollen grain in *Moringa pterygosperma* is spheroidal tricolpate with three equatorial germinal pores placed equidistantly. Exine is smooth, provided with a granular texture. Fig. (11) [1] Exactly this type of pollen grain also occurs in *Violaceae* (cf. Woodhouse, 1935 and Erdtmann. 1943). As Woodhouse (12) puts it, 'in no other part of the plant are to be found packed in so small a space so many readily available phylogenetic characters'.

Considering all the characters and view points the present writers are inclined to consider that the family *Moringaceae* should be placed near the family *Violaceae* in the Order No. 12 Violales of Hutchinson (6) as both the families seem to be phylogenetically related.

SUMMARY

The examination of the floral and other characters shows that the family *Moringaceae* seems to be phylogenetically related with the family *Violaceae*.

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EXPLANATION OF FIGURES.

1. Flower. × 1½.
2. Sectional (vertical) view of flower showing the positions of sepals, petals, stamens and carpels. × 3.
3. 5 sepals on the calyx-tube. × 1½.
4. Petals- (a) â and a″ Posterior two. × Nat. size.
   (b) b′ and b ″— Lateral two. × Nat. size.
   (c) c— anterior. × Nat. size.
5. Staminode. × 4.
6. 5 stamens with 4 staminodes. × 4.
7. One single stamen. × 5.
8. Carpel. × 5.
9. Sectional view of the ovary—diagramatic.
10. Floral diagram of *Moringa pterygosperma*.
11. Pollen grain of *M. pterygosperma*. × 1400.

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[1] The diameter of the pollen grain in *Moringa pterygosperma* is 38-40μ in width but Puri (7) observed it to be 20-25μ.

OBITUARY NOTICES

THEODORE RATHBONE HUBBACK

(1872-1944)

(*With a plate*)

Theodore Rathbone Hubback was born in Liverpool on 17th December, 1872, and was the second son of the late Joseph Hubback, J.P. of Liverpool. He was educated at Cranbrook School in Kent and was articled as a Civil Engineer to the late George Fosbery Lister, Chief Engineer of the Mersey Docks and Harbour Board. On the completion of his articles he was appointed an Assistant Engineer on the staff of some of the large docks on Mersyside.

At the end of 1895 he was appointed by the Colonial Office as a District Engineer in the P.W.D., Selangor, one of the Native States in the Malay Peninsula before the days of Federation. His first appointment was that of District Engineer, Klang. He subsequently went to British North Borneo as Director of Public Works. On relinquishing this appointment he returned to Malaya and was engaged on large schemes of road construction in Negri Sembilan.

He then turned his attention to rubber planting and opened up an estate in the Kuala Pilah district of Negri Sembilan where he remained until 1919, when he disposed of his property and moved to Pahang making his home at Bukit Betong near Kuala Lipis.

Soon after his arrival in Selangor he became intensely interested in big game, in those days Klang and the coast districts contained a large number of wild elephant and the hunting of these animals was the beginning of many years of study of wild life in Malaya. After he settled in Pahang he was appointed Honorary Chief Game Warden of that State where wild life, especially elephant and Seladang, abounded in the large areas of virgin jungle. He drew up a scheme for forming a National Park for the preservation of wild life but the project met with considerable opposition from officials and a section of the non-official community. After much correspondence he was appointed by the Colonial Office as Commissioner to hold an enquiry on the general principles of the preservation of wild life and the formation of a National Park. Unfortunately the whole of his recommendations were not accepted and the establishment of the National Park was never properly carried out.

He latterly gave up hunting big game and devoted the whole of his energies in photographing wild life. Many of his articles and photographs were published in Journal of this Society in 'The Field' and 'Country Life', he also took a number of cinema films which he used to show at various times.

He lived in Pahang until his death. When Malaya was invaded by the Japanese in 1941, he was ordered to evacuate to Singapore, this he refused to do and went with two Malay servants up into the Ulu Tembeling District of Pahang with full stores and equipment intending to form a camp in the jungle until the Japanese were driven out. In February 1944, he was murdered while in camp but his murderers have not yet been discovered. In his young days he was a fine athlete. He played cricket for Lancashire in 1892 when he was 19 years old and he represented the Straits Settlements on more than one occasion. He also played Rugby football for Liverpool in the days when Liverpool had one of the best sides in the north of England.

With his death, the Society has lost a generous patron and benefactor who repeatedly contributed to the cost of plates in our Journal. His zealous work for the protection of wild life in Malaya is outstanding, and equally so was his knowledge of its wild animals as evidenced in his writings and his fine camera portraits of Malayan wild life.

R.I.P.

SIR DAVID EZRA

(1871-1947)

By the death of David Ezra, Kt., at the age of 76 at his Calcutta residence on August 23, 1947, the Bombay Natural History Society has lost a very old Life Member and Vice-Patron. Born in 1871 of a wealthy family of one of the earliest Jewish settlers in India from Bagdad he never stinted his services for enhancing the dignity of his community's contribution to India's progress, specially in the field of humanitarian work. Loved universally for his affable manners and never-failing courtesy and humility, he seems to have earned the confidence of all, high and low, and for almost a period of 40 years his was a strikingly popular figure in Calcutta's social functions. The exalted office of the Sheriff of Calcutta, which he held in 1925-26, was yet another opportunity to him for giving the best of his civic services.

He was a lover of Arts and patron of learning. The Royal Asiatic Society of Bengal elected him its President for two terms in succession (1940-42). He was a member of the Honorary Committee for the management of the Zoological Gardens, Calcutta. From an early age he appears to have focussed his interest on animals and birds, of which he was an indefatigable collector. His Calcutta house, which contained his menagerie, might be termed a veritable Zoo. Along two sides of the boundary walls of his compound the ranges of bird houses are located, and the swannery is on the south side. Besides, there are stables, paddocks and enclosures for rare animals and the larger birds. These represented mostly exotic species and foreign specimens. He had almost a passion for pets, tame animals and talking birds, and the pursuit of his hobby in this direction enabled him to acquire unique experience in the taming and management of his diverse collection. In this collection one could see prize zebras, baby bears, hunting cheetas, Assam elephant, Manchurian Crane, turkeys, swans from the King's Swannery, rare ornamental waterfowl, pheasants, and game birds, charming members of the parrot tribe from abroad, Birds of Paradise, Bataleur Eagle from South Africa, etc. He was a race-horse owner and seems to have taken pride in the mere possession of some prize animals. But he was never known to bet on his or others' horses, preferring always to race for the sheer love of the sport.

S. C. LAW.

REGINALD INNES POCOCK, F.R.S.

(1863-1947)

(*With a plate*)

By the death of R. I. Pocock, Zoology has lost a versatile naturalist and the Society a valuable contributor. Reginald Innes Pocock was the son of the Rev. Nicholas Pocock, and was born at Clifton on March 4th, 1863. He was first at school in Clifton and afterwards in Oxford from where he went to University College, Bristol. Shortly after completing his studies there he was appointed in 1885 to the staff of the British Museum (Natural History) and given charge of the *Arachnida* and *Myriopoda*. He took up the study of these invertebrates with great zeal and soon made a name for himself. Between 1887 and 1910, he wrote some thirty papers on the fauna of India and adjacent countries, as well as over a hundred on that of other countries. One of his first contributions dealing with the Indian Region, was on the Myriopoda of the Mergui Archipelago collected by Dr. John Anderson, published in 1887. Eight years later he contributed to the Journal an account of the *Galeodidae* inhabiting India and Ceylon, and this was the beginning of Pocock's long connection with the Society. He was specially interested in scorpions and published in the Annals and Magazine of Natural History for 1890 a paper on a collection made in Travancore by Edgar Thurston. About this time he began to correspond with our founder, the late H. M. Phipson, who at his request, appealed to members to collect scorpions. Large numbers of scorpions, alive and dead, were received at the Society's rooms as the result of this appeal and among them were several new species which Pocock described in the Journal for 1897. The first volume of the *Fauna of British India* had been published in 1888 and Pocock was asked to write on the *Arachnida,* etc. He completed his first volume on the Scorpions, *Uropygia, Amblypygia* and *Solifugae* and part of the *Araneae* in 1901. Unfortunately before he had finished his second volume, dealing with the remainder of the *Araneae,* Pocock retired from the British Museum and was appointed Superintendent of the Gardens of the Zoological Society in 1904. He had always been interested in Mammals, and while at the Museum had made collecting trips to the Balearic Islands and Spain, in search of small mammals, with the late Oldfield Thomas.

At the Zoological Gardens he had ample opportunity to study live animals, especially his favourite groups, the monkeys, carnivora and ungulates. He took every advantage of examining in the prosectorium any animals which died, making drawings of the soft parts and dissecting the facial and other glands. Henceforth he

The late R. I. Pocock, F.R.S.

contributed a large number of papers on these investigations to the *Proceedings* of the Society and one of the most important was on 'The specialised cutaneous glands of Ruminants' which appeared in 1911. Before he had been very long at the Gardens he made the acquaintance of the late Major Rodon, a keen naturalist and a generous contributor of specimens to our Society and donor of live animals to the Zoological Society. Among the latter was a goral from Chumba, which roused Pocock's interest, and he commenced to study these animals and their allies, the serows. The result appeared in the Journal for 1910 under the title of 'The Serows, Gorals and Takins of British India and the Straits Settlements'. This was the beginning of the long series of papers on mammals which he contributed to the Society's Journal.

When it was decided to bring out a second edition of the earlier volumes of the *Fauna* Pocock was invited to write on the larger mammalia. He used the Society's Journal as a medium to publish his preliminary revisions of the different species. This resulted in arousing a keen interest in members of the Society, and both the Society and the British Museum benefited considerably by the donation of specimens, while Pocock received many valuable notes on the habits and distribution of the different animals. In 1939 the first volume was published and dealt with the monkeys and part of the carnivora, while in 1941 the remainder of the carnivora were treated in a second volume. At the time of his death, Pocock was engaged in the third and final volume which would have contained the rest of the large mammals—the ungulates to the elephants. Unfortunately the MSS. for this volume is so far incomplete that it will not be possible to publish it.

The new volumes were a great advance on the first edition. The systematic treatment was thoroughly up to date and no pains were spared to make the paragraphs on habits interesting which makes these volumes indispensable to the systematic worker, the sportsman and the naturalist. In the last number of the Journal, was published a paper by Pocock which was one of a series on the Wild Asses of Asia. When he began to write this paper Pocock realised that it was necessary to see additional specimens of the Kutch Wild Ass. He appealed to Mr. W. S. Millard and, as was always the case, his appeal was not in vain. Through the good offices of Mr. Millard, the Maharao of Kutch was approached; Mr. Sálim Ali went to the Runn and collected the necessary specimens and afterwards wrote the first accurate account of this animal's habits.

Pocock was a very careful worker and took immense pains to trace the origin of scientific names of animals he wrote about; he was also widely read in all books dealing with the animals in which he was specially interested. His knowledge of natural history was not confined to spiders and mammals but he had a wide general acquaintance with many groups. He wrote many articles both on vertebrates and invertebrates for some of the well-known Natural Histories. For many years he was natural history editor of 'The Field' a post calling for a wide acquaintance with all branches of natural history.

Apart from natural history, Pocock was a keen sportsman, and in his younger days played Rugby football, obtained his cap for Gloucestershire and at the Civil Service sports was a winner of short-distance races and the long jump. To the end he kept up his interest in football and cricket and was a regular spectator at all important matches.

Shortly before his death Pocock had been absent from the Museum for some days but appeared to have completely recovered and was back at work again. He had made arrangements to watch a cricket match on Saturday, August 8, but passed quietly away in his sleep early that morning.

N. B. K.

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Hybrid between a Lion and Panther, vol. xxii, p. 187.
1914 Description of a new species of Goral (*Nemorhaedus*) shot by Capt. F. M. Bailey, vol. xxiii, p. 32.
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Pt. II (7 plates), vol. xxxiv, p. 307.
1930 Tiger or Panther? Limouzin's specimen (2 plates), vol. xxxiv, p. 544.
The Lions of Asia (5 plates), 1 map. vol. xxxiv, p. 638.
Wanted Bears! Vol. xxxiv, p. 1052.
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ALEXANDER EDWARD JONES

(1878-1947)

Died in Simla of heart failure on 17th October 1947 after a short illness at the age of 69.

A. E. Jones joined the Society in 1910 and was an active and useful member during his long connection with it. His various contributions to the pages of the Journal have added substantially to our knowledge of Indian birds. In 1944 he made a gift to the Society of his entire collection of some 3,000 bird skins, the fruits of careful and discriminating collecting in many parts of India for over 30 years. Most of these specimens were shot and skinned by Jones personally. Their freshness and the high standard of their preparation testify to the care he devoted to them. The precision of the labelling makes this collection a particularly valuable acquisition to our Museum and provides excellent comparative material for taxonomic work.

Jones was a keen and reliable observer. His knowledge of the avifauna not only of the Simla Hills and neighbouring areas but also of many other parts of India was extensive. Nor was his interest confined to birds. He was deeply interested in flora and in insects and has made some valuable contributions to our knowledge of the butterflies of what may almost be called his native hills.

Being a contemporary of such well-known ornithologists as Stuart Baker and Hugh Whistler, Jones imbibed from them by correspondence and by personal contact a keen appreciation of the problems connected with Indian ornithology. The frequency with which he is quoted both in the *Fauna* volumes on Birds (2nd edition) by Stuart Baker and in the same author's *Nidification of Birds in the Indian Empire* is a tribute to the high esteem his knowledge and integrity enjoyed. For though the proprietor of a flourishing tailoring business by profession, Jones missed no opportunity of indulging in his hobby (ornithology) in the intelligent and effective manner which made him the unquestioned authority on the birds of his area.

Though in regular correspondence about their common interests, the writer of this note was never fortunate enough to make Jones's personal acquaintance. Those near him describe him as a genial and loveable man whose sincerity and sympathetic help at all times endeared him to every young naturalist with whom he came in contact. His letters amply reflect these qualities. Jones's enthusiasm for birds was contagious as many have testified who got to know him at close quarters.

The name of Jones has been permanently enshrined in the annals of Indian ornithology by the two races of birds that have been called in his honour. One of these is a Spotted Babbler

Pellorneum ruficeps jonesi Stuart Baker, Bull. B.O.C. Vol. xli, p. 9, 1920: Kalka,

and the other a Long-billed Vulture

Gyps indicus jonesi Whistler, Bull. B.O.C., Vol. xlvii, p. 74, 1920 Rawal Pindi.

In response to constant pressure from friends anxious that his unmatched knowledge of Simla birds should find permanent record, Jones was at long last persuaded to work up his notes and diaries into a comprehensive paper on the 'Birds of the Simla and adjacent Hills'. The second part of this paper appears elsewhere in this issue of the Journal. Only one more part is available in manuscript form and it is indeed a pity the author did not live to complete the work. With the help of his bird collection and such of his notes as may be available, the Editors will endeavour to the best of their ability to complete the account of the birds Jones met with in that area. It is feared, however, that this may be no more than a bare list since we understand that his diaries were mostly written in a private shorthand which will probably be undecipherable.

Jones was the first ornithologist to discover the occurrence of the Black-throated Diver (*Colymbus arcticus*) in India in 1922, a record which has not been repeated since and which forms a notable addition to the list of Indian birds.

The following is a list of the more important contributions of A. E. Jones published in the Society's Journal:—

Notes on Birds from Lahore, xxi, 1073.

Himalayan Long-billed Vulture (*G. tenuirostris*) breeding near Ambala, xxiv, 358.

A List of Birds from the Simla Hills, 1908-1918, xxvi, 601.

Further notes on Birds of the Ambala District, Punjab, xxvi, 675.

Bird Notes from the Campbellpur-Attock District, W. Punjab, xxvii, 794.

Occurrence of the Black-throated Diver (*Colymbus arcticus*) in India, xxviii, 1134.

Nightjars on the Simla Hills xxix, 286.

The Breeding of the E. Orphean Warbler (*Sylvia jerdoni* Blyth) in the North-West Frontier Province, xxvii, 630.

Further Notes on the Birds of the Ambala District, xxxi, 1000.

The Nesting of the Basra Sparrow-Hawk (*Accipiter virgalus affinis*) at Simla, xxxv, 208.

Nesting of the Hobby (*F. subbuteo*) near Simla with some general remarks on the genus *Falco* and allied species, xxiii, 579.

Further Note on the breeding of the Hobby (*F. subbuteo*) near Simla, xxiv, 359.

Note on the Nidification of the Green Shrike-Tit (*Pteruthius xanthochloris*), xxiv, 369.

Nesting of the Booted Eagle (*Hieraëtus pennatus* Gm.) in the Simla Hills, xl, 568.

A Note on the Lycaenid Butterfly (*Everes dipora*), xl, 133.

On the differences between *Lycaenopsis huegelli huegelli* and *Lycaenopsis ladonides gigas*, xl, 134.

S. A.

MISCELLANEOUS NOTES

1.—BEHAVIOUR OF HYENA AND PANTHER AT A 'KILL'

As it is asserted by many shikaris from experience—as well as by others without the experience—that a panther will not return to, or will not feed again on a kill visited by a hyena, also that the hyena will sometimes drive away the feeding panther, the following account of an incident may be of interest to the shikar fraternity, as well as to others. Actually the occasion was comprised of a series of varying incidents covering a period of about 2½ hours, with intervals brief and long. But the phase of greatest interest to myself was that during which I had, perforce, kept the scene illuminated by my electric torch for perhaps four minutes, with all the actors on the stage during that time.

The kill (a calf) was in the large bare compound of an unoccupied house. A public road and dwellings lay along the front of the compound, other houses and compounds with intervening walls lay adjacently to the first in one direction; the fourth side was open ground and ended at the brink of a cliff far away—the only direction in which to safely fire a heavy rifle, while the opposite side of a common intervening wall offered an ideal place for the 'gun'.

The kill was brought about 5 yards nearer (within 20 yards) and was not pegged down, as I hoped that the sound of the panther dragging away the carcase would warn me of its presence. As a pariah dog arrived just after dark, half a dozen stones were collected for such visitors.

About 11 p.m. a large hyena was discovered, backing away on its haunches with the carcase in its jaws and almost clear of the ground. It was driven away by a flung stone and the carcase brought back to its proper place. It returned after a few minutes (detected quite by chance), was subsequently joined by another and it was only by good luck that these two were detected from time to time approaching the carcase, for they were not readily driven away. During this phase, the behaviour of the large hyena indicated that the panther had, to his knowledge, arrived—somewhere in the dark background—and soon I saw its eyes, about 40 yards beyond the kill. They appeared there just after I had replaced the carcase for the second time.

I was now obliged to switch on my torch at frequent intervals, and thus discovered another panther's eyes somewhat farther off than the first and about 30 yards to one side. As the monsoon wind was blowing from behind me and towards the scene, with the panthers to leeward of the hyenas, I was curious to know whether the larger hyena could see those eyes in the artificial light as I could, or had he previously located their owner there, for he made frequent excursions in the general direction of the first panther. As their forms were invisible to me in the light of my 3-cell torch at that range, I was never able to see this hyena again, nor saw his eyes, until he began to re-appear returning to the kill; so I could not tell exactly where he had been, for the eyes of both panthers remained stationary during each of these scoutings except the last one, when the eyes of the first panther moved lower to the ground and then disappeared.

Finally, both hyenas were closely about the kill, moving to and fro with nervous uncertainty under the brilliant shaft of light but obviously preparing to get busy with it, and in the background were the steady gleams from the eyes of both panthers. Standing up I expended all my stones and scared off the smaller hyena (? female). In desperation I hissed and 'shoo-ed' at the other; but only when I resorted to slapping my hand upon the wall loudly did he go away. Almost immediately after, and while the light was still on, the first panther began to approach. It came into the glare of the torch at a fast walk, to one side of the kill till abreast of it; then it turned towards it—giving a couple of glances directly into the light, with screwed up and blinking eyelids—and, when about 4 yards from the kill, was confronted by the lager hyena. The latter seemed to have materialised there suddenly, about the same short distance away—the two animals face to face. The panther hesitated, stopped, and turning away (towards the light) began retracing its steps at a slower pace. I retain no visual impression of any change in its demeanour or carriage at that moment, except perhaps that the high-held, alert head was slightly lowered—until it paused to look into the light again. It did not look back at the hyena.

About 1-30 a.m. the eyes of the other panther appeared, but now nearer. Unfortunately the heavy recoil of the rifle had disarranged the seating of the torch as well as the delicate contact mechanism, so that I had to reach forward with my right hand and hold the contact 'off'. When switched on again this panther had gone—for good. I feel that the behaviour of the hyenas and panthers in this affair was unusual—as extraordinary as that of the 'gun' was too.

IONA VILLA, K. BOSWELL,
KHANDALA. *Captain, I.A.M.C.*
12*th August* 1947.

2.—THE SENSE OF SMELL IN TIGERS

Mr. R. C. Morris's comments on the note by Mr. T. E. H. Smith, in the April 1947 number of the Journal are of interest and his theory that the tiger has a hound sense of smell is borne out by the following incident.

In January 1936, I was camping in the foot-hills near here, and had three young buffaloes tied up as bait for tiger. One morning news was brought to camp that one of the buffaloes had been killed and was lying where it had been tied up at a junction of two forest rides.

I went out to the place, only to find that the tiger had in the meantime returned, broken the rope and dragged the carcase into the jungle. I had not brought a gun, as my intention had been merely to build a machan then, and to go back to camp for my gun at lunch-time. I started to follow up the drag, but the jungle soon became very dense, and as it seemed rather a risky procedure, I decided to return to camp for my rifle. By the time I had got it, and eventually located the remains of the kill, it was getting quite late.

The carcase of the buffalo, minus one hind leg, was lying in a rocky nullah in a most unsatisfactory situation. The only possible place for sitting up was in a little clump of bamboos some ten yards away. I hastily built a small machan in this, about six feet from the ground, and sent my men away, talking loudly as they went.

I started sitting up at 2 p.m., as it gets dark fairly early there during the winter, and the spot was a long way from any habitation. The shikaris had only been gone about 15 minutes, when a barking-deer gave a bleat of alarm from further up the ravine.

At 3-15 I happened to take a look out of the peep-hole in the front of the machan, and saw the tiger already there. He was about ten yards beyond the kill and was slowly approaching it down the nullah, and appeared to be sniffing the ground or examining it with his head down in a very short-sighted manner.

Unfortunately, this being the first tiger I had ever seen in a wild state, I was keener on bagging him than on observing his habits, and I did not watch him for long. But one would hardly expect a tiger to be myopic, and I am convinced he was in fact smelling the ground after the fashion of a dog. He was a young male of 8′ 9″, in excellent condition, and there was nothing apparently wrong with his eye-sight.

It would seem that he had probably heard my men leaving the neighbourhood of his kill an hour before, and that he was trying to verify by sense of smell what he had previously heard.

Whether my shikaris had put any clothes or blankets on the ground while building the machan, I cannot now remember, but it is unlikely, as this was during the cold weather and they would probably not have discarded any of their clothing. The spot where the tiger appeared to be smelling the ground was on the far side of the kill from the machan and I do not think any of my men had been there.

The tiger did not seem to have winded me in the machan at all, though I was only twenty yards or so away and not very high up.

SINGELL, T. E., C. J. T. WRENICKE
KURSEONG, N. BENGAL.
14*th September* 1947.

3.—'DEATH CRY' OF TIGER

The 'death cry' of a tiger, mentioned by Lieut.-Col. Burton, in the Journal of April 1947, must be of great interest to all who have hunted this animal and will doubtless surprise many; for I wonder how many have heard it, or even read about it in the better known books on shikar of the past or present. His description of the cry, likening it to a 'loud cat-yowl' reminds me of a somewhat similar cry uttered by a tigress—but long after she was wounded—and of the kind which I had believed was only associated with courtship or mating.

Having lost her tracks on hard ground and then the blood trail ceasing, I was ascending a short, bare, rocky spur and was a little higher than a clump of trees about 50 yards away on one side, when I caught the pungent odour one associates with the presence of tiger or panther—though I have never detected it on a dead one. The jungle man with me noticed it almost immediately after and, while we stood staring down into the clump, we were startled to hear amazingly loud 'caterwaulings' issuing from it—precisely like those uttered by cats when mating, but magnified many times more in volume; they continued for 10 or 15 seconds without our being able to detect the slightest movement in that cover.

To the best of my knowledge then there was only one other tiger in the block during that month (May), a male, and I never found evidence of their consorting together. My first impression was that the male was forcing his attentions upon the wounded tigress (I killed her later and, from certain peculiarities I drew his attention to, my jungle man declared she was a 'byla'—barren female); my impression that the male was molesting her was created by a note of agony in the sounds. Then I assumed that she had got into painful difficulties with her broken shoulder in some dense undergrowth of bushes and strong creepers I knew to be in that clump, and was not aware of our presence. But, whatever the case, it was never solved; for dusk was approaching and, as I already had a buffalo tied near the lower edge of the clump, I postponed investigations to next morning and then could not find any signs at all of a tiger having been there—instead, I found a dead 'chausingha', gun-shot by a poacher. Two other sounds strange to me and uttered by this tigress were a soft, high-pitched 'whimper' shortly after she had received the wound and, later a brief, low moan.

About 4 seconds after being knocked down by the shot she reared upright to an astonishing height before falling again—uttering the tearing grunts of her kind as she went lungeing and falling towards my right rear. Then she limped hurriedly and mutely a few more yards to the cover of some high bushes, where she seemed to pause, and then fell heavily, uttering a faint whimper remarkably similar to that of a dog when one handles its injured paw—no louder. After a while, she slowly hobbled further and I heard her making a careful effort to lie down again; heard her body settling on dry leaves and this was followed by the low moan—quite human in its quality.

I mention these two sounds because, coming from a tiger, they were strange and unexpected to me. The 'caterwauling', though heard by many others with more opportunities, was new to me and, in the circumstances, puzzling to account for.

I have heard a boar utter a long drawn and piercing scream as it fell and died. A scream so high-pitched and prolonged that I thought the very thing I had feared might occur had now happened—that my bullet had glanced off the hard ground and was travelling a great distance beyond. For, sleeping outside my tent with my terrier, he had almost nightly warned me of the proximity of a prowling panther, whose eyes were almost invariably revealed by my electric torch, but then always between me and the village about a ¼ mile beyond. The pig, however, was in a direction at right angles to the other; nevertheless, so prolonged was the scream that my apprehensions persisted for some time after, for I had fired in hasty annoyance at being disturbed.

IONA VILLA, K. BOSWELL,
KHANDALA. *Captain, I.A.M.C.*
5th September 1947.

4.—PECULIAR REACTION OF A DOG TO THE HOOTING OF A SIREN

In the compound of my house on the outskirts of Benares there lives a domestic dog (a black mongrel about 12 years old). I have seen him ever since I first occupied this house in May 1942.

About a quarter of a mile from the house is situated the city's Electric Power House which sends forth every morning at 7 o'clock the loud hoot of a whistle or siren lasting for about one minute. In 1942, the morning 'whistle' was a shrill, high-pitched one, somewhat similar to those of the pre-war engines on the Indian Railways. Sometime in 1943, the Power House changed over from the shrill whistle to a comparatively low-pitched siren with a hoot very similar to that of the British-pattern air-raid sirens familiar to us during the War, and to the modern American-pattern railway engines; the pitch is higher than those of the customary steamer sirens.

Every morning, with religious regularity, the dog, as soon as he hears the siren, starts sending forth a series of loud, characteristic wails which last for the duration of the siren's hooting, i.e., about one minute. He wails in whatever position he happens to be at the moment—whether standing, sitting or lying—and with the face raised upwards. I have noticed this reaction almost every morning since 1943 to date (September 1947). To the older whistle which the Power House used to blow in 1942, the dog never reacted in this manner. As I was not on the lookout, I cannot say whether the new reaction started immediately after the change-over from the whistle to the siren, or after an interval of days or weeks, but I have a distinct re-collection that it started not very long after the change-over; it has continued ever since. The explanation of the difference in the dog's reaction to the whistle and the siren-hoot obviously lies in the difference of the pitch of the sound waves.

In addition to the morning hoot, the siren also blows at 12 noon and at 1.30 and 5.30 in the afternoon. The dog's reaction to these is similar but rather less regular. The explanation is that at these periods of the day there is a considerable amount of noise in the air, and the siren-hoots are not heard with the same clarity as in the early morning.

In the same compound there also lives an oldish black bitch and her buff-coloured son (born middle 1944) from the old black dog. In the vicinity of the house live several other mongrels. None of them has ever exhibited the peculiar reaction to the siren-hoot mentioned above.

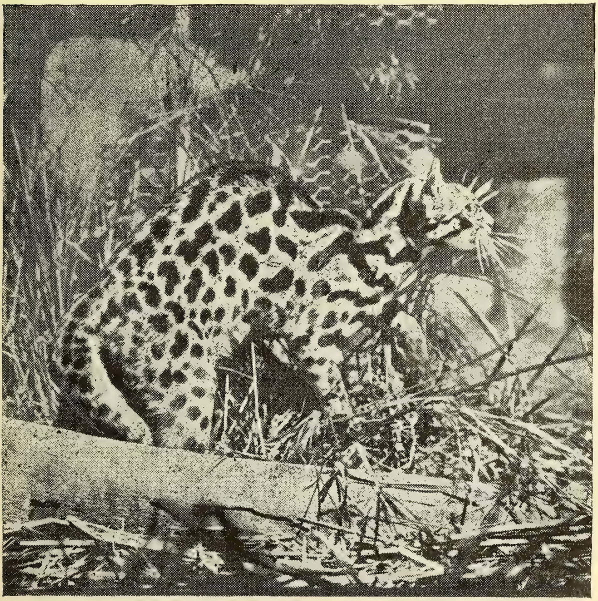
Benares Cantt.
24th September 1947.

M. L. ROONWAL, M.SC., PH.D.
(CANTAB), F.N.I.,
Zoological Survey of India.

5.—ON THE LEOPARD CAT. (*PRIONAILURUS BENGALENSIS*)

(*With a photo*)

A few years ago, some friends of mine went home and left a young leopard cat aged 7 months for me to look after. I was pleased to have this opportunity of making the acquaintance of so beautiful, slender and graceful a cat, and was keen to find out for myself whether



Leopard Cat

it was possible to tame these animals in captivity. It had been found with another (which had died of pneumonia when very young) near Dimapur in Assam, and had been brought up by the daughter of the family in the bungalow. It used to roam about the bungalow, and used to come when called for its food. But it could not be called tame, as it would not allow itself to be handled or even stroked.

After taking this cat over, I kept it for four months in my bungalow, and tried my utmost to make friends with it. But it was not having any. It grew more and more savage, and at feeding time it was extremely difficult to get food to it without getting attacked. So, most unfortunately, it had to be destroyed.

I wonder if anyone has ever succeeded in taming this creature ?

About its breeding habits, I notice that Sterndale says that it is said to breed in May, and to have three or four kittens at a time. Whereas in the 'Wild Animals of the Indian Empire, Part III' published by you, it says 'It has 3 or 4 cubs in a litter. A kitten a month old was taken in August in the Nilgiris.' As far as Assam is concerned, the leopard cat aged 7 months which was given to me was born in August. But I once also got a kitten near Golaghat in Assam on March 26th, 1937 (two were found, but one died before reaching me). Is it not therefore probable that the leopard cat has two litters a year, as the Indian Jungle Cat and others are supposed to do ?

Concerning the number of kittens, in each case two were brought, and as far as I know no more were found. But it is possible that there were more.

DOYANG T. E.,
OATING P. O.,
ASSAM.
12*th August* 1947.

E. P. GEE

[There is no fixed rule as to how any species of animal reacts to conditions of captivity. It is largely a question of individual behaviour. An individual of a given species may remain fierce and resentful, another become tame and docile. All observers agree that the Leopard Cat is excessively savage and untameable. When caged, it usually remains by day, crouched in a corner and snarls at all who come near. But Blanford refers to one he saw in the London Zoo, which unconcerned, paced up and down its cage by day, came when called by its keeper and appeared thoroughly tame.

Little specific is known of the breeding seasons of most Indian animals even of the commonest species. Some apparently have fixed breeding seasons, while with others the young are produced in any month of the year. But there is usually a period when breeding activity is more marked. These periods again vary with latitude. Speaking generally, animals living in the higher altitudes of the Himalayas, produce their young early in spring or summer when food supplies are more plentifully available. In tropical lands where climatic conditions and food supplies remain more or less uniform—there is more elasticity in breeding seasons and in the periods when young are produced.—EDS.]

6.—PROCESSION OF MUSK SHREWS

I noticed a phenomenon a few days ago which I describe herein.

While sitting in the drawing room of my bungalow and listening to the radio, my wife drew my attention to what appeared to her a snake passing from under one sofa to another. As I sat up to look towards this, I found that the so-called snake looked very peculiar in that it had no shiny look on it, nor its head and tail prominent. As I was looking on it, the tail part divided and presently two small musk shrews started running about the room. The rest of the so-called snake moved on. I then noticed that it was nothing but a mother shrew pulling behind a train of her young ones on their first outing. It appears that there were altogether five of the young ones, each keeping itself fixed by clinching with his teeth the point on the upper side of the junction of the tail with the body of another. A few minutes later, the mother shrew returned and went back with one young one to where she left the other three. She came back again and looked for the last lost one and after collecting him she went back to join the rest.

I wonder if this is the normal habit of the musk shrew. This is the first time that any of us has observed such a phenomenon.

P.O., BARIPADA,
MAYURBHANJ STATE,
ORISSA.
21*st August* 1947.

R. N. DE, B.SC., F.R.G.S.
(LOND.), I.F.S. (Retd.)
Chief Forest Officer.

[‘ Musk Rat ’ and ‘ Mole ’ are names commonly given to the Musk Shrew, a common animal in India seen about dusk in gardens or entering houses after lamp light. The sharp piercing squeaks it gives out when frightened are the more usual indications of its presence. Though rat-like in general appearance, mole-like in its groping movements, it is neither rat nor mole—nor any form of rodent but a shrew, included with other forms of shrew in the order *Insectivora*. The habit of the young following the mother in a ‘ train ’ as described in the above note, was noted by ‘ Eha ’ in his ‘ Tribes on my Frontier ’. Shrews because of their insectivorous habits are useful creatures about the house. The Plague Commission also records their utility in the destruction of rats.—EDS.]

7.—THE HABITS OF THE BRUSH-TAILED PORCUPINE (*ATHERURUS MACROURUS*)

While in the outer ranges of the Naga Hills of Assam during May 1947, I obtained from the Lhota Nagas some information on the habits of the Brush-tailed Porcupine.

It is known to them as the ‘ Tsetang ’, and is mainly confined to the extreme outer ranges; most Nagas from the inner hills do not know of it. Its invariable habitat is said to be heavy primary forest, and in this it differs from the Common Indian Porcupine which is distributed over the Naga Hills regardless of the biotope.

It lives in small colonies (family parties?) of six to eight, and in long burrows, regarded as too long to be worth excavating, although the animal is regarded as a delicacy. I was shown a burrow; it was dug out of sandy soil in the depths of the forest, and had a diameter of about twenty-four inches at the entrance, but narrowed down considerably a short way in. There were two well-defined, narrow tracks leading up to the entrance, each a maze of foot-prints.

Not far away was a fallen, hollow tree with signs of occupation by some animal: I was told that it was a 'resting place' of the porcupines.

The Nagas say that although they may be common in an area of forest, the burrows are never closer than about a quarter of a mile. It is believed that one burrow is occupied for several years, after which a new one is dug. I was shown several deserted burrows.

They are strictly nocturnal, and are never seen by day: the whole band is said to come out after dusk and roam through the forest together.

SHILLONG, ASSAM C. R. STONOR

[Skulls of the animals referred to in the above note were submitted to us by the author and identified as those of the Brush-tailed Porcupine (*Atherurus macrourous*) a primitive Indo-Malayan species found in India only in Assam. It is distinctive in its long scaly tail ending in a tuft of bristles. Nothing is known of its habits in the wild state.—EDS.]

8.—THE NILGIRI TAHR (*HEMITRAGUS HYLOCRIUS*)

A Duel between Males

I thought that the following observations on the social life of the Nilgiri Tahr (*Hemitragus hylocrius*) would be of interest to you.

The place where the events took place is a peak named Metlamallai (5333 ft.) in the High Wavy Mts. and the date was 3rd August 1947.

I was out on the ridge near the peak hoping to be able to shoot a fine 'Saddleback', which I had seen last year; and I was trying to see signs of where the herd of 'Ibex' were; when my attention was drawn to a solitary buck grazing some 400 yards away. He was not a Saddleback but had the white bars on the head and the white patches above the knees.

Thinking that he might be a sentry for the rest of the herd, which I presumed was round the other side of the ridge, I proceeded to stalk him in the hopes that I would find my Saddleback with the herd.

Having got to within 150 yards, I discovered that the buck was accompanied by a doe and ¾ grown young one, who were lying down beside a rock. The buck appeared to be watching something the other side of him as he kept looking in that direction and stamping his forefeet. After a few minutes a Saddleback appeared beyond the buck and unconcernedly approached him, and his charge. As the Saddleback was not the one I was after, I resolved to just watch the ibex through my binoculars, to see what was going to happen, as it was obvious that the young buck objected strongly to the Saddleback's approach, and I thought that there might be a fight; at least I hoped so.

The first thing that happened was when the Saddleback was about 10 yards from the buck, the latter jumped down from his rock and approached the Saddleback, who seemed to take notice for the first time. He stood and looked at the buck with his head on one side and stamped his forefeet.

Then, both animals stopped and seemed to look each other over. They did nothing for about five minutes other than stamp their forefeet and nod their heads at each other. The doe in the interval had climbed up on to the rock, that the buck had left and lay down sideways on it facing the two bucks. The young one just grazed about close by.

The summing-up of each other finished, the two animals. almost simultaneously reared up on their hind legs and seemed to 'dance' in front of each other, while keeping their distance and circling. Suddenly they would close in and bring their heads together with a resounding crack. I am sure they must have hurt each other, as I could actually hear the sound of the impact of their heads from my position. These antics went on for about half-an-hour during which time the doe never stirred, and seemed to take a great interest in the proceedings. The bucks began to get a little tired towards the end as they used to stop to nibble a bit of grass or something; but they were always on their guard since usually one or the other of them would suddenly charge at his opponent and try to take him unawares. The blows usually fell upon each others heads, where it didn't seem to matter.

The buck was caught off his guard once, and took the blow from the Saddleback on his shoulder which made him lose his balance, and before he could regain it the Saddleback closed in, and with repeated buffetings forced the buck to retreat, which it did, presumably having had enough.

The Saddleback stood for a few minutes and watched his retreating foe, and then he turned round and came up to where the doe was. She never moved till the Saddleback climbed up beside her and butted her side once or twice when she promptly got up and got into position for mating, this took place on the rock itself and lasted about fifteen minutes during which time the buck left the doe twice for a short interval. The doe then jumped down from the rock and lay down at its foot.

In the meantime the young ibex had wandered a bit and got to about the same level as me and about 100 yards distant where it must have seen me as it suddenly dashed down the hill, to its parent. The Saddleback then looked in my direction and whistled loudly and then all three of them dashed off down the hill, out of sight.

This put an end to the most interesting hour's entertainment that a wild animal has yet given me.

I should add that all this took place between the hours of 1 p.m. and 2 p.m. in bright sunshine.

CLOUDLAND ESTATE,
CUMBUM P.O.,
MADURA.
7th August 1947.

A. F. HUTTON

[To my note on the Nilgiri Tahr (above), I would like to add, that I visited Metlamallai again on the 14th instant, and the Saddleback and doe and young one were still in each other's company in the same locality, so it looks as if the doe is accompanied by the buck for some time at least, after mating.—A.F.H.]

9.—THE 'WATCHING' ATTITUDE OF THE CHEETAL OR SPOTTED DEER (*AXIS AXIS* ERXL).

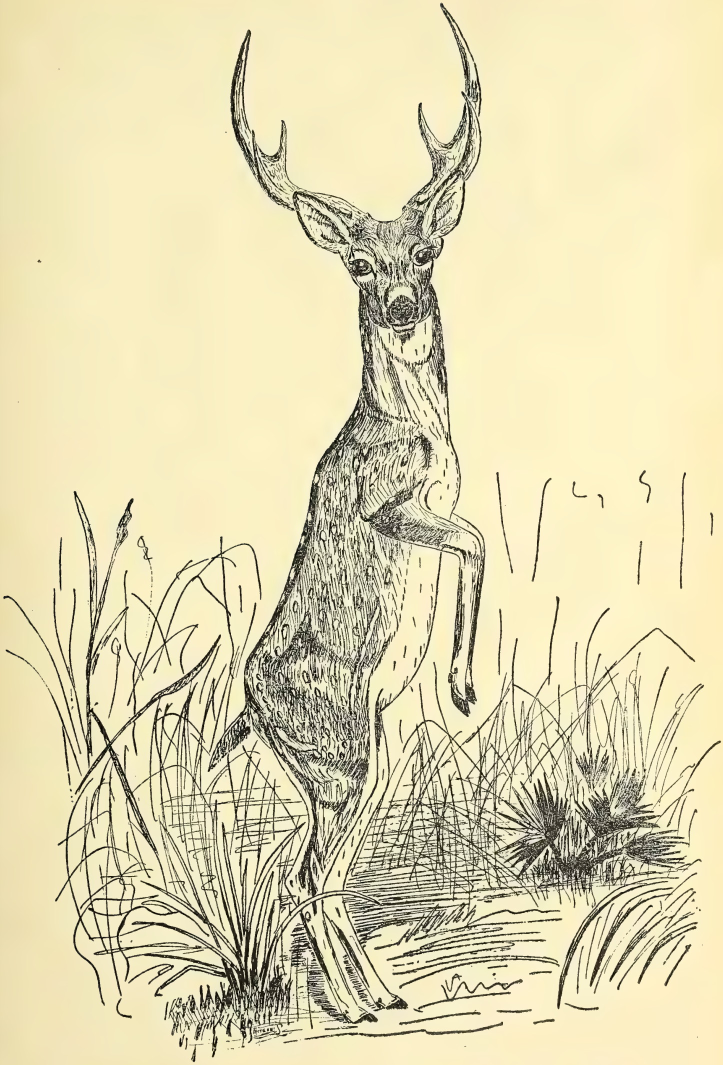
(*With a plate*)

The following observations were made while out on a shoot in the Motichur Forest, about 8 miles north of Hardwar in the Dehra Dun Division of the United Provinces, in the second fortnight of May 1947.

Beyond a rivulet in the forest was a large, half-open grassy space, covered here and there with tall sal and simal trees. It was the feeding ground of game. In this area we saw one morning a herd of about seven hind of chital, coming out cautiously to drink. Behind them, walking slowly, there soon appeared a magnificent stag which kept close to the herd. A hind which lagged behind the rest was promptly spurred forward by the stag by means of savage digs of his antlers in her flanks. The stag then threw his head backward and gave forth a loud, challenging bellow. The hind at this time appeared to be considerably excited and soon another stag, smaller than the first and with short antlers, appeared. The latter at once ran towards the new comer and, with lowered head, charged him, so that he ran away. The hind seemed to watch this performance with some alarm and gave forth shrill calls.

By this time we had crossed the rivulet and the smaller stag again came into view not very far off, but he had suspected our presence and was moving cautiously. At this moment, when he was behind a high bush, he suddenly stood up on his hind legs, like a performing bear, and scanned the horizon (sketch). He remained in that position for a few moments, trying to locate the danger and ran away when we fired at the other stag. As this 'watching' or standing attitude has not been commonly observed, I think that it is worth recording.

It may be added that the 'standing' attitude is occasionally found in other mammals and even in some insects, and serves a variety of purposes. The rearing up of the bear and the horse are familiar examples and are probably a preliminary to attack. Less familiar examples come of insects where mantids occasionally adopt this attitude to frighten away the chasing enemy (vide Roonwal, *Proc. R.*



Hiteshi, H. L.—The watching attitude of the Cheetal or Spotted Deer
(*Axis axis* Erxl.)

Ent. Soc. Lond. (A), **13**, p. 71, 1938; and Cott, *Adaptive Coloration in Animals*, London, 1940, pp. 221, etc.).

ZOOLOGICAL SURVEY OF INDIA,
BENARES CANTT.
H. L. HITESHI

[The stag rearing on its hind legs was simply trying to increase the range of its vision. It is something which many species of mammals do: particularly the short limbed forms such as Mongooses, Civets, Weasels, Martens and Bears. When suspicious a bear will stand up on its hind legs and look gropingly around. Such rearing up is not necessarily the prelude to attack—that would depend upon the point of attack and its height from ground level. Horses and their kin the wild asses rear up on the hind legs in combat and strike with their fore limbs. It is a habit seen also in deer, particularly when their horns are in 'velvet'. Stags compelled to fight in this condition, rear up and strike with their fore-feet after the manner of hinds. Where vision is concerned, rearing up on the hind legs cannot be described as a usual 'Watching attitude' of deer. It is one which may be resorted to under special circumstances in forest or bush land when the radius of vision is limited.—EDS.]

10.—STRANDING OF WHALES ON THE COASTS OF INDIA

I am collecting data on whales in Indian waters. May I request your help, as also that of your readers, in supplementing the records I have been able to collect in the attached list?

Date	Locality	Length	Other details
1748	Pondichery	30 ft.	Referred to in Ananda Ranga Pillay's famous Diary.
1757	Pondichery	160 ft. (?)	
1842 Sep.	*near* Chittagong	...	Rorqual.
1848 ?	Quilon	100 ft.	Rorqual.
1851	Amherst island (Arakan).	84 ft.	Rorqual (Jaws, etc., in Indian Museum.
1852 July	Salt Lakes near Calcutta.	...	A shoal of many dozens of the Indian Pilot Whale *Gtobicephalus indicus*).
1858	Quilon	90 ft.	Rorqual.
1864	Masulipatam	...	...
1866 ?	Vizagapatam	7 ft.	*Cogia breviceps.*
1871 June	Sittoung estuary	...	*Balaenoptera edeni.*
1873 July	Off Baluchistan coast	...	Megaptera.
1874	Mangalore	48 ft.	Baleen whale (bones in Madras Museum),
1879	Dwarka	50 ft.	...
1883 Feb.	Varvala (Okhamandal)	12 ft.	...
1884 ?	Bombay	...	Killed by 'Euphrates'.
1884 ?	Karachi	...	Killed by 'Dalhousie'.
1890 Jan.	Madras	24 ft.	*Physeter macrocephalus.*
1890 Dec.	Pamban	...	Killed by 'Abdur Rahman'.

Date	Locality	Length	Other details
1891	Mangalore	60 ft.	Skeleton in Madras Museum.
1901	near Cape Comorin	73 ft.	Bones with B.N.H.S.
1902 Feb.	Trivandrum	...	*Psendorca crassidens.*
1906	Bassein	63 ft.	...
1907	Rajakamangalam	...	Skeleton in Trivandram Museum.
1911	near Ratnagiri	71 ft.	...
1912	Ratnagiri	61 ft.	...
1919	Tithor (Mahisagar, Baroda)	71 ft.	...
1923 Jan.	Madai (Malabar)	...	Rorqual.
1924 ?	Pudiangadi (Calicut)	...	...
1924 Oct.	Gullalamedu lighthouse, Divi., Kistna Dt.	...	...
1924 Dec.	Karwar	48 ft.	...
1925 July	Westhill, Calicut	38 ft.	Rorqual.
1926	Baliapatam, Cannanore	48 ft.	Skeleton at St. Aloysius College, Mangalore.
1927	Chala, Tellicherry	22 ft.	...
1927 Nov.	near Cherai, Cochin	94 ft.	...
1928 ?	Gogha (Kathiawar)	30 ft.	...
1931	Shika (Jamnagar)	73 ft.	...
1932	Nirodumunai (Ceylon)	35 ft.	*Balaenoptera musculus.*
1932 May	Trincomali (Ceylon)	40 ft.	Bore gunshot wounds.
1934	Parur, Travancore	...	...
1934 Feb.	Polhena, Matara, Ceylon.	...	..
1934 May	Colaba, Bombay	52 ft.	Rorqual.
1935	Anjuna, Goa	...	Rorqual.
1935 March.	Vadanapalli (Malabar)	50 ft.	...
1937	near Danushkodi	...	...
1937 Feb.	Pullam, Travancore	45 ft.	Rorqual skeleton in Trivandrum Museum.
1939	Between Suratkal and Moolki	80 ft.	Skeleton in K. High School, Mangalore.
1939 Oct.	near Cape Comorin	50 ft.	...
1939 March.	Mulvel (Okhamandal)	79 ft.	(J.B.N.H.S. Vol. XLI, No. 4, pp. 895-197).
1939 March.	Anjuna, Goa	50 ft.	...
1941 ?	Broach	...	...
1942 Feb.	Anjengo	...	...
1942 Jan.	Vadgamnear Sabarmathi.	67 ft.	(Prakrith 1942, Vol. I, No. 2, pp. 102-115.)
1943 March.	Aramda (Okhamandal)	23 ft.	(Indian Science Congress, 1947, Zoology and Entomology Abstracts, p. 14),
1944 Nov.	Gajanaara, Baroda	71 ft.	
1945 Nov.	Moboro, Carmona, Goa	56 ft.	...
1947 Jan.	Naduvattam, Calicut	45 ft.	...
1947 March.	Chinnaganjam, Guntur	72 ft.	...
1947 May	Ernakulam	40 ft.	...

BARODA,
9*th June* 1947.

S. T. MOSES,
Director of Fisheries.

[Pillay's record of a whale '160 feet' long mentioned in the above list is open to grave doubts! The dimensions of the Great

Indian Fin Whale (*B. indica*) is given as 80–90 feet. For further records, vide *Journal*, *B.N.H.S.*, Vol. XXIII, pp. 576-7.—EDS.]

11.—NOTES ON SOME BURMESE MAMMALS

(*With a photo*)

The following jottings regarding some of the mammals of Burma may be of interest. Much in the notes concerns living specimens in the Rangoon Zoological Gardens.

Pocock (Fauna of Brit. India, Mammalia, Vol. II, pages 162 and 3), mentions that the litter of the Red Dog (*Cuon*) may be as many as seven; Col. Burton, (*J.B.N.H.S.*, Vol. XLI, p. 697) gives up to seven or ten, and cites nine embryos taken from a dead female. There is at present in the Rangoon Zoo a pair of these dogs (*Cuon alpinus* ssp.) which breed regularly once a year. The young are born in about December or January. The litter born in January 1946 numbered nine, and this year there were seven whelps. I am told that none of these puppies are ever reared, the bitch either killing or neglecting them. I am not sure whether the bitch comes on heat about the middle of the year or not, though I have an idea she does, but if so it seems that she does not breed then. I don't know if the litters are always as large as the above, as I have not been in Rangoon when she has had any others.

I persuaded the then Superintendent to let me have the last remaining pup of the 1946 litter on the grounds that it would die any way if left with the bitch. This was a female and the eyes were open. She was about a fortnight old. The eyes were blue and the colour, as usual dark. She reminded me much of a fox cub (*Vulpes vulpes*) of similar age, but her smell was not really like either dog or fox. The nearest description I can think of was she smelt like an English domestic ferret. She would not take milk from a glass dropper, but would lick it from my hand, and soon learned to lap. After only a few days she was fed on beef, and ate a surprising amount for such a tiny creature, and seemed to be thriving on it. I could unfortunately keep her only a fortnight and then I returned her to the Zoo. She died soon afterwards, death being attributed to a change from beef to horse-flesh. She was unfortunately completely blind. When she died, at the age of about two months her ears were fully erect and the coat losing the dark colour, and assuming the characteristic red tinge. I should like to have been able to keep her and bring her up to maturity.

Her voice was similar to a domestic puppy's of like age, but the only noise I have ever heard the parents make is a kind of cackling chatter, though I once heard the Indian Wolf in the Gardens (*Canis lupus pallipes*) give a bark not unlike that of a domestic dog.

A young female Leopard Cat (*Prionailurus bengalensis*) which I acquired at Hopin in North Burma had been kept on a long string, dirty and fed only on milk, though past the milk stage. Being therefore very hungry, it was only a matter of hours before she overcame her timidity and would take meat from my fingers. After taking the rope off her neck, and transferring her to a small travelling cage I always fed her by hand. Once I had given her water to drink she would never again look at milk—naturally enough. She would eat anything in the way of meat including cooked dehydrated meat granules and corned beef. She used to lick my fingers, sometimes gently taking a finger between her teeth, and occasionally pat my hand in play.

With strangers she was as wild as she had ever been, but as far as I was concerned the only thing taboo was picking her up, which I could accomplish only when I could get her by the scruff of the neck.

Considering how badly this cat had been treated before I got her, I think she showed remarkable tolerance towards me. After a short time in Rangoon Zoo she died of anthrax (diagnosed by the Veterinary Research Institute, Insein).

The species is common in Burma and the proper Burmese name is 'Thit Gyak'.

Regarding the other representative of the genus found in Burma, the Fishing Cat (*P. viverrinus*), Pocock (Vol. I, Mammalia, p. 284), though inferring from the extensive range of the species that it occurs in Burma, states that there seems no record of it from that country. This of course is incorrect and several specimens have been recorded from Burma. There is at present in the Rangoon Zoo an adult male from Insein district, Southern Burma. The Burmese call it 'Kyaung Ba', which Pocock gives for the Jungle Cat (*Felis chaus*), and the name is probably applicable to both.

On external characters it would seem that this cat (*P. viverrinus*) is correctly referred to the same genus as the Leopard Cat. I don't know if living specimens have been compared together before, but from certain angles I have noticed that the head appears very similarly shaped in both, and there is also a characteristic 'facial expression', differing from the look on the face of a typical *Felis*.

In fact, apart from colour and length of tail, the living Fishing Cat, appears just a larger model of the live Leopard Cat.

From my own short experience in Burma I would not describe the Jungle Cat (*Felis chaus* ssp.) as common in Burma. I have never seen one in that country, though have come across a number of specimens of the Leopard Cat.

The Golden Cat (*Profelis*), the Marbled Cat (*Pardofelis*) and the Clouded Leopard (*Neofelis*) are all very rare and seldom recorded, though the name for the Golden Cat 'Kya min' or 'king of the cats'[1] seems to be fairly well known.

A name I heard given to my attempted description of a Clouded Leopard was 'Thit tet kya' meaning a 'tree top tiger, or leopard,' but the name, as well as the animal is not at all widely known.

The common term of description in Burma of all the small cats, as well as civets, palm civets, ferret badgers and possibly other small carnivora is simply 'Kyaung' (cat) or 'Taw Kyaung' (jungle cat) though for many of them there are proper names in Burmese.

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[1] This name has significance in the belief prevalent, e.g. among the jungle Karens of Tenasserim, that tigers live in such terror of this cat that even a single hair of its body carried on the person will keep a tiger away from the carrier.—EDS.

On p. 417 of Mammalia, Vol. II, Pocock ridicules the idea of the Ferret-Badger (*Helictis personata*) being able to defend itself against Burmese pariah dogs. In my opinion, knowing the type of pariah, or 'pye dog' indicated, this ridicule is quite without justification.

The 'pye dogs' of Burma, as in many other areas, except those trained and kept for hunting (as in some places they are), would, I am certain, not dream of going anywhere near a ferret-badger or any other of the small carnivora. These dogs are almost purely scavengers and from what I have seen of them would much prefer eating filth off a pile than tackle even the rats on the same heap, let alone going after anything like *Helictis.*

A tame mongoose of mine (*H. javanicus*), if anything smaller than the two specimens of *H. personata* now in Rangoon Zoo, once showed that he hadn't much to worry about where pye dogs were concerned. A pair of these pariahs approached him one day, and walked up to him, with heads outstretched and legs stiff. Rikki (the mongoose) turned and took a pace towards them, prompted by the curiosity so typical of a mongoose, and at this gesture both dogs about turned and trotted off smartly. The mongoose pursued them for a short distance, and having so to speak 'seen them off the premises' resumed his investigation of the grass bordering the road. (In pursuing the dogs, I firmly believe the only desire on the part of my mongoose was to satisfy curiosity.)

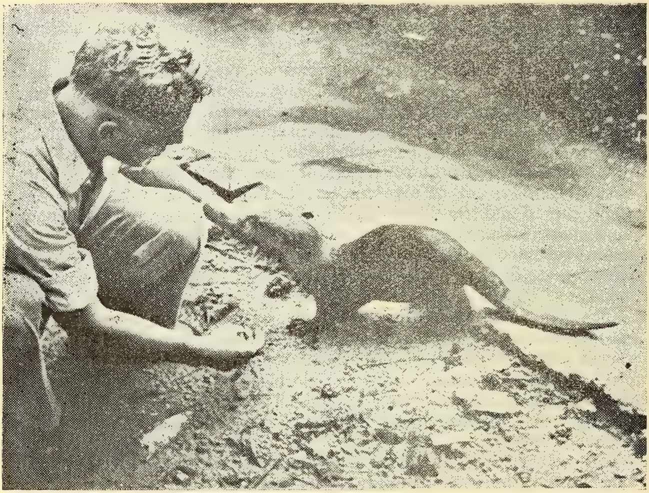
The point is that either of the dogs, had they the desire and courage to do so, could easily have killed the mongoose. I consider therefore that Tickell's ferret badger anecdote should not be discredited, and that no ferret badger would be in any way endangered by pariah dogs (apart from any question of 'warning colouration' or speical means of defence). With a properly trained hunting dog, such as a terrier, it might be a different matter, though even then the ferret badger would probably give a good account of itself, as all the family is noted for courage and tenacity of life.

Lutrogale perspicillata, the Smooth Indian otter, is said by Pocock (F.B.I. Mammalia II, p. 292) to have been described by Hodgson as having the tail more flattened than is the case in *Lutra* and *Amblonyx.*

During the past year or so there have been a number of specimens of this otter in the Rangoon Zoo, and I have noticed the following points about them. First, it seems that 'smooth coated' and 'sleek' are not particularly applicable to living specimens, though by the side of one of the other forms they might well appear somewhat smoother by comparison, I don't know. But the tail, or rudder, was quite definitely flattened for most of its length in the five or more live specimens I have seen, both male and female, juvenile and adult.

I am certain this otter could be easily identified from other Oriental forms by the rudder alone, and I consider the most suitable trivial name that could be suggested for the species is 'Flat-tailed Otter' (the flattened tail can be clearly seen in the attached photograph). Others of the species I saw in the Calcutta Gardens had the tail flattened in like manner. A striking feature of the 'flat-tailed' otters in Rangoon was the way in which they so quickly became accustomed to humans. Even a fully adult female, timid enough at first soon learned that fish was often the result of answering the human voice, and was soon in vigorous competition with her companion in diving for the fish thrown to them.

With the young I have spent hours playing, rolling them over both on land and in the water and was never bitten, though often my hands were between their teeth.



The Smooth Indian or Flat-tailed Otter.

Regarding the habits of these otters, I do not know how nocturnal they are in the wild (they lose of course most of any such habits in captivity), but an otter presumably *L. perspicillata*, was observed by the boatman of a canoe I was in, on the Shweli river in North Burma, one morning long after sunrise.

It has often been stated that otters always come to the bank to eat a fish. While they undoubtedly often do this, and no doubt have to in the case of a very large fish, the ones in Rangoon often eat a fish in the water, either treading water and holding it in their fore paws, or, when it is half eaten, swimming and tilting their heads back so as to keep the fish above the water. From the way in which they do, this I would say it does not seem altogether an acquired captivity habit, and probably they do it in the wild too on occasion. Otters always make a good exhibit in a Zoo, where they get wonderfully tame and show quite an amount of intelligence.

To finish this note I will relate a kind of legend I have heard in Burma concerning the bat.

The story goes that the animals (=mammals) and the birds were engaged in a war. When the animals were winning, the bat claimed to be one of them, while if the birds seemed to be in the ascendant it associated itself with the avian fraternity. Hence, according to my informant, to call a person a Bat in Burmese is to designate him a turncoat, who tries to throw in his lot with the winning side.

BOMBAY,
7th August 1947. W. F. H. ANSELL

12.—DISPLAY OF A MALE MINIVET.

In May 1946, while in the Naga Hills, I had a very brief view of a display by a male minivet. I was not able to determine the species, so it may have been either the Common or the Short-billed.

My attention was first drawn to a small red dot above the trees of a valley below me: and it proved to be a male minivet soaring up with out-spread wings. After attaining the top of its flight, it spiralled down, wings still outstretched, and perched on top of a tall tree. Very soon it took off again, and soared up once more in the same manner—the bright scarlet shown off to perfection in the sunlight.

There was a female in a tree nearby, which suggests a sexual as against a threat display.

Although my observation was a momentary one, I put it on record as nothing is known of the displays of the minivets.

SHILLONG,
9th September, 1947. C. R. STONOR

[In volume XXXIV of the *Journal* (p. 1061), Mr. C. McCann has described the courtship antics of a pair of Scarlet Minivets, also from the Naga Hills. The female suddenly flew up high into the air from its perch on a branch. The male gave chase, caught her up and seized the tip of her tail in his bill. Both birds came spiralling down, separated when a few feet from the ground and returned to the tree. The manoeuvre was soon repeated. Mr. Stonor's observation records only the male in solo display. It would be interesting to learn the true significance of the two forms of behaviour.—EDS.]

13.—OCCURRENCE OF THE LAGGAR FALCON (*FALCO JUGGER* GRAY) AT MT. ABU

In April a pair of Lagger Falcons visited our garden in Abu and were twice seen in Jamun trees. A few days later I saw them again down below the Nakki Lake and the following day out near Bendermere. This is the only pair of Laggar Falcons I have ever seen in Abu which I have visited off and on since 1928. Last week I was out for a walk among the rocky hills two or three miles south, west of St. Mary's School where there is an isolated pinnacle of rock some 300 ft. in height which I have named 'Cleopatra's Bodkin' (you may recognise the rock from this description) and was looking for a means of ascent when my attention was drawn by the activities of what I think must have been the same pair of Laggar Falcons to a small cave in the side of the cliff in which were two young laggars. I studied them through my binoculars from a distance of about 40 yards. Yesterday I went out to the same place and found the family still there with the two young birds in the same cave evidently not yet able to fly but with their feathers very nearly fully developed. The young birds were both very dark on top, almost black, with black moustachial stripes running down from in front and below their eyes and their under parts were of bright reddish brown streaked with black, beaks blue grey, legs bright yellow, claws black.

THE WILDERNESS, R. K. M. BATTYE, MAJOR I.A., I.P.S.
ABU, 16*th June* 1947.

[This, curiously enough, appears to be the first specific record of the Laggar for Mount Abu, though it is one of the most generally distributed falcons throughout the length and breadth of India. The recent Gujarat Ornithological Survey procured two specimens at Deesa in Palanpur State, about 50 miles south-west of Abu.—EDS.]

14.—THE ALTITUDINAL LIMIT OF THE PHEASANT-TAILED JACANA [*HYDROPHASIANUS CHIRURGUS* (SCOPOLI)]

While fishing recently (June) on the Vishan Sar, a mountain lake in Kashmir, whose altitude is given as 12,050′ I was much surprised to see a Pheasant-tailed Jacana.

I see Stuart Baker's book says it is to be found to a considerable altitude in the Himalayas, being common on the Kashmir lakes.

It is common on the Anchar Lake in Kashmir whose altitude is about 5,200′. It however struck me as unusual to find the bird at 12,050′. If this altitude is, in fact, unusual, perhaps your readers may be interested to read of this.

GHAT 23, CHINAR BAGH,
SRINAGAR, F. A. BETTERTON
14*th July* 1947.

[According to Whistler ('A Popular Handbook of Indian Birds,' 3rd ed., p. 447) the Pheasant-tailed Jaçana occurs in the Himalayas commonly on the Kashmir lakes at 5,000 ft. (about the altitude of Srinagar and the Vale) and straggles up to 12,000 ft. Lt.-Col. R. S. P. Bates, an authority on Kashmir birds and co-author with E. H. N. Lowther of 'The Breeding Birds of Kashmir' (now in press) informs us that he has never seen one in Kashmir outside the Vale. Vishan Sar lake has provided a number of surprises from time to time, one of the more recent ones being a Black-winged Stilt (*Himantopus h. himantopus*) reported thence by Mr. W. T. Loke in the summer of 1944.—EDS.]

15.—RECOVERY OF RINGED DUCK IN INDIA

A bird ring bearing the inscription Moskwa 75330 E was sent to us recently by Mr. J. A. M. Ede (then of Ajmer) with the following particulars :

Date of recovery : 23rd December 1945.
Place of ,, : A tank about 6 miles from Kishangarh, Rajputana.
Recovered by : Mr. E. Claudius, Reserve Police Lines, Ajmer.

The duck from which the ring was obtained was described by the shooter as a Garganey Teal.

The Bird Banding Bureau, Moscow, when intimated, supplied us with the following particulars concerning the ring :

Date of ringing : 27th July 1945.
Place of ,, : Astrakhan, Volga Delta.

They pointed out however that the bird was a Pintail, and not a Garganey as identified.

114, Apollo Street,
Bombay.

EDITORS

16.—THE GREAT CRESTED GREBE [*PODICEPS CRISTATUS CRISTATUS* LINN.] IN BHAVNAGAR STATE

Mr. Sàlim Ali has asked me to write a short note on the occurrence of the Great Crested Grebe in Bhavnagar. He mentions that, the bird in this part of the country constitute a very interesting record, the southernmost in India. Its appearance in August apparently in the middle of its breeding season is strange and of particular interest. The Great Crested Grebe is known to be a regular breeder in Tibet and Kashmir and sporadic records of its having bred as far south as Karachi are noted in the Fauna of British India (E. C. Stuart Baker).

On 22nd August, 1947, I had taken some friends out shooting and as they were keen to bag a few Nukhta drakes we visited some tanks one of which was round and large and about 200 yards wide. Here I noticed what seemed to me at first to be a solitary Pintail drake but as soon as the binoculars were handled, I immediately recognised it to be a Great Crested Grebe for in my schoolboy egg-collecting days I had seen this species on one of the reservoirs in England. Though I never succeeded in collecting the eggs which were then considered extremely rare, I had some glimpses of the birds in their natural surroundings. As this rare bird which we were eagerly watching came into range, it was bagged with one shot and later revealed to be a female. On going round the tank we saw the male bird and as the tank was very thinly reeded another bird could hardly have been overlooked. However, visiting the same tank on 24-8-47, a pair was seen of which the male was bagged with one shot. The remaining female then became very wary diving and re-diving at great distances out of range. This is the first time I see the Great Crested Grebe here and you can imagine what a great surprise it was for me. The particular tank contains a fair amount of small fish and aquatic life which could easily have enticed the birds to stay for any length of time.

DIL BAHAR, K. S. DHARMAKUMARSINHJI
BHAVNAGAR,
24th August 1947.

[Apart from being the southernmost Indian record for the Great Crested Grebe, interest attaches to the birds being found in Bhavnagar as early as August when many of their *confrères* would still be busy nesting on their Kashmir and trans-Himalayan breeding grounds. The species is a comparatively rare winter visitor to the larger jheels in N. India. The Bombay Natural History Society's collection has a specimen obtained at Gajner Lake, Bikaner, on 22nd March 1933 and another from Viramgam (Kathiawar)—13th March 1905.—EDS.]

17.—MORNING SONG OF BIRDS

(24th May 1947)

These observations on the serial succession of bird song were conducted by a group of masters and boys of the C.M.S. Schools, Srinagar, in the gardens of Dr. P. Edmonds, Principal and the Rev. Canon C. E. Tyndale-Biscoe. The trees are beautifully arranged in such a way that the big trees are surrounded by bushy under-growth like a real forest. In between these trees, there are open spaces and lawns like glades in a forest, which make the whole place a natural bird sanctuary. Shady plane trees, willows, mulberries, acacias, poplars, oak and walnut, rose bushes and creepers afford suitable nesting sites for the birds. Hence we find here a fair variety of summer visitors and sometimes rare species on spring and autumn migration.

It is worthy of record that Cuckoos have now occupied this side of the town, and that the Paradise Flycatcher is the first bird to open the morning orchestra.

What a joy it is to listen to this celestial music! The young and the old, the healthy and the diseased, find infinite happiness by keeping their ears open at this blissful hour to receive the melodious symphony.

We are very grateful to Mrs. Edmonds who very kindly accommodated the whole group in her house with motherly care.

4-15 a.m.	Paradise Flycatcher. (*Tchitrea paradisi leucogaster*)
4-21 a.m.	Cuckoo. (*Cuculus canorus*)
4-22 a.m.	Second Paradise Flycatcher
4-23 a.m.	Third Paradise Flycatcher
4-26 a.m.	Cuckoo. . . . . distant
4-28 a.m.	Paradise Flycatcher
4-29 a.m.	Tickell's Thrush (*Turdus unicolor*) Cuckoo and Paradise Flycatcher Golden Oriole (*Oriolus oriolus kundoo*)
4-30 a.m.	Golden Oriole, Cuckoo
4-31 a.m.	Tickell's Thrush

Golden Oriole, Cuckoo (Intermittent Song)
4-32 a.m. Thrushes from different quarters. Golden Oriole and Cuckoo
4-33 a.m. Ringdove. (*Streptopelia decaocto decaocto*)
4-33 a.m. Thrushes, the Golden Oriole. The Cuckoo stopped
4-34 a.m. Second Ringdove and Golden Oriole
4-35 a.m. Thrush, Golden Oriole from different directions, Cuckoo
4-38 a m. Ringdove, Golden Oriole, Thrush, Cuckoo
4-41 a.m. Tit. (*Parus major kaschmiriensis*)
Golden Oriole, Thrushes
4-44 a.m. Ringdoves from different quarters together
Tit, Golden Oriole, Thrushes: the chorus in full swing
4-53 a.m. Ringdove, Golden Oriole, Thrush
A lull
4-56 a.m. Hoopoe. (*Upupa epops epops*)
The Golden Oriole, Thrush, Tit, Ringdove, Bulbul. (*Molpastes leucogenys*)
A scream of kite (*Milvus migrans lineatus*)
4-59 a.m. Sparrow (*Passer domesticus bactrianus*), Myna (*Acridotheres tristis tristis*) and Starling (*Sturnus vulgaris humii*) with chirping melody joined the chorus
5- 1 a.m. Myna, Thrushes, Ringdoves together
5-11 a.m. Thrushes, Orioles, Ringdoves
5-14 a.m. Crow (*Corvus splendens zugmeyeri*)
Sparrows, Golden Orioles
5-18 a.m. Thrushes stopped, one Ringdove continues.
5-20 a.m. Rufous-backed Shrike. (*Lanius shach erythronotus*) The bird is a mimic. It has no real song. It lies in wait to butcher other birds. (! ?—EDS.)
Several Mynas attacked a kite
5-24 a.m. Several Ringdoves together. Golden Oriole
5-28 a.m. *Tuck-Tuck-Tuck*, the alarm calls of Tickell's Thrush

Just before sunrise a note *hyo-o* of male Koel (*Eudynamis scolopaceus.*) It is a straggler and has re-appeared after five years. Probably not the same bird.

The sky was partially covered on the eastern side by flakes of fleecy clouds. The sun rose at 6 a.m. The height of Srinagar is 5,200 feet above sea-level. Latitude 34° N.; longitude about 75° E.

C. M. S. CENTRAL HIGH SCHOOL,
SRINAGAR, KASHMIR, SAMSAR CHAND KOUL
25*th May* 1947.

18.—THE LATE STAY OF MIGRATORY BIRDS IN BHAVNAGAR, KATHIAWAR

This hot weather has been most interesting in bird life. We have had an influx of Purple Moorhens all along our coast; they have come in hundreds. Then I have seen the common Pochard throughout the hot weather at odd times. Only yesterday I saw a pair in a pond with a male Shoveller, a pair of Spot-bill, and Lesser Whistling Teal and I also shot a male Garganey which had practically changed into winter dress and was flying well. On the sea-shore, I saw Oyster-catchers, Curlews, Red and Greenshanks, and Lesser Flamingoes with young (newly arrived). How strange it was to see all these birds together at this time of the year!

BHAVNAGAR, K. S. DHARMAKUMARSINHJI
24th June 1947.

[The S-W Monsoon was exceptionally erratic this year. Kathiawar and Kutch had practically no rain till the middle of August.—EDS.]

19.—ON THE COMMON BLIND SNAKE (*TYPHLOPS BRAMINUS*)

Two years ago when I was stationed with the United States Army near Midnapur, Bengal, I came into the possession of a snake of the genus *Typhlops* and wrote to you concerning its identity.

I have recently had an opportunity to examine this specimen more closely, and it occurred to me that you might possibly be interested in the results of this examination.

The snake is definitely a *T. braminus*; length, 168 mm.; diameter at region of the heart, 3.1 mm. It was captured and killed 14th June, 1945 and is a gravid female.

The eggs, which were seven in number, were rather well formed in the posterior region of the body—though less well so in the more anterior regions. The posterior egg measured 13.5 mm. in length and 3.1 mm. in diameter. It was covered with a well formed, distensible, membrane or shell which, however, lacked the external covering of long fibers characteristic of ophidian eggs. Upon microscopic examination, it appeared to be composed of very short fibers overlying one another in a completely random orientation.

CHICAGO, Ill, U.S.A. WARREN P. SIGHTS
22nd July 1947.

20.—AGGRESSIVE DEMONSTRATION BY RUSSELL'S VIPER (*VIPERA RUSSELLI*)

Yesterday at sunset, Mr. W. Ivanow and myself were walking from Naogaon to Kihim by the main village road. We found a Russell's Viper, about 2½ ft. long, lying by the roadside. As we passed it, it hissed and began to move away slowly. It was so close to an overgrown parapet wall that it could not be killed with a stick. In order to induce it to come out in the open, I stamped my foot on the ground and made some noise. Upon this the viper turned round and deliberately leaped forward menacingly a foot or so in my direction obviously by way of a threat demonstration. I withdrew my foot quickly, whereupon the snake calmly returned to its former position and moved on, seemingly unperturbed, till it found refuge in a pile of stones.

This is the first experience I have had of a snake demonstrating in this manner, and I would be interested to know if this habit has been recorded. It postulates a consciousness of its own potency on the part of the reptile; its unhurried departure after the feint would suggest that it is a normal practice. Perhaps some reader can tell us more about it.

'YALI', KIHIM (KOLABA DIST.), A. A. A. FYZEE
15*th May* 1947.

[Russell's Viper is sluggish in habit and ordinarily displays a reluctance to move even when approached by man. It is this habit to lie up or bask on open paths and roadways and the snake's disinclination to leave the resting place that lead to its being trodden upon and to people being bitten. In this character the Russell's Viper is markedly different from most snakes whose first impulse upon human approach is escape. The viper's 'demonstration' in the instance described above was a natural reaction and protest against disturbance; its unhurried departure, its characteristic mode of progress. —EDS.]

21.—HAMADRYAD AT BHIM TAL, U. P.

Having discredited first hand accounts of the King Cobra being seen and killed at Bhim Tal, 4,500 feet above sea level, I was witness to its confirmation on the 23rd June 1947.

While having tea with Col. Jones he mentioned that a large snake had been reported shot that morning in the process of swallowing another snake of about five feet. We both agreed that if true, this may be a Hamadryad and decided after tea to visit the place but half a mile from his lovely house. The whole party including Miss Kalberer accompanied us to the spot. Miss Kalberer I should mention is the oldest European resident of Bhim Tal with some 50 odd years in the place, during which time she can recollect six other instances of King Cobras being killed in the valley. She identified this as the same species as was killed on previous occasions.

This was a fine specimen, 10½ feet long in perfect condition except for the head which was shot away. The occipital shields with the perietals had been shot away but the skin of the hood with cross chevrons were intact. The colour was chocolate with dirty white or yellow chevrons all the length of the body fading into stars or broken chevrons on the tail. The throat was yellow, and ventral scales entire dividing at the end of the tail.

This is the seventh apecimen killed in the last 22 years, and all but one, which was shot swimming the lake below Lake View Hotel, have been accounted for at the top end of the lake or towards Sath Tal. Col. Jones's father shot a pair near his house and in later years Miss Leslie shot another at the same place. Another pair were shot above the upper bazar on the hill to the right.

No case is on record of any one being attacked, or cattle killed, and there is no name for the snake in the local dialect which points to them being stray visitors from the Gola or Naini stream through Sath Tal.

This snake was shot by the main road to Sath Tal from Bhim Tal in a thickly populated part. It was first seen by some small boys, who looked on at the gorging from a few yards away while others ran back to the village to call the headman with his gun. At no time did it show any signs of aggressiveness and allowed the man to come within five yards and shoot it.

BHIMTAL,
DIST. NAINI, U. P., A. ST. J. MACDONALD
14*th August* 1947

[The King Cobra is fond of water and takes to it readily, It has been met with at an altitude of 6,000 ft. in the Himalayas and Nilgiris.—EDS.]

22.—NOTES ON *THE FAUNA OF BRITISH INDIA*: REPTILIA AND AMPHIBIA, by Malcolm A. Smith

Volume III Serpentes, 1943

Page 114. The range of John's Sand Boa : **Eryx johni johni**

This snake is common in the neighbourhood of Trichinopoly and Madras. Specimens, young and old, caught and bottled by me are to be found in the museum of St. Joseph's College, Trichinopoly, and in the Loyola College Museum, Madras.

Page 415. The Common Krait : **Bungarus caeruleus**

I have a specimen five feet long, caught at Guindy near Madras. Four feet six inches specimens are not rare in the neighbourhood of Madras. Four feet specimens are common.

Page 429. It is stated that 'there is no marked difference in size between the sexes of Cobras.'

I once measured fifty cobras as they were brought to me day by day by my snake-catchers.

The biggest, a male, was 68 inches long.

Twenty-five were males, and twenty-five were females.

The average length of the twenty-five males was 57⅓ inches ; of the females 54½ inches.

Page 489. Saw-scaled Viper or Phoorsa : **Echis carinata**

The range of the Phoorsa is stated to be 'the whole of India south of the Ganges, except Bengal'.

I spent three years—June 1944 to May 1947—at Ranchi on the Chota Nagpur plateau (1,500–2,000 feet high), a dry region with a hot weather temperature of 105° F. I questioned villagers and missionaries from outlying stations about the snakes found in their districts. Not one had ever seen or heard of a Phoorsa, or knew what it was. Some had mistaken the Cat Snake (*Dipsas*) for a Phoorsa. I lectured on snakes in a score of camps within a fifty mile range of Ranchi. Kraits, both the Common and the Banded, and Cobras, had been killed in the camps but the Phoorsa was quite unknown.

ON THE BREEDING OF THE INDIAN PYTHON: **Python molurus**

I have two tame pythons, known as Benjamin and Jacob, both females, their names notwithstanding. They were given their names fourteen years ago, when they were only a few days old, and once given, the names remained. Jacob was born (hatched out) on 22nd July 1933; Jacob on 24th July 1933. The eggs were laid by different mothers, both wild.

On 28th March 1938, I put a male python (tame) into their cage. On 4th April 1938, Benjamin and this male mated; I watched them, and took them in my arms. Jacob must have mated a few days earlier. On 4th June 1938, Jacob laid 21 eggs; on 31 June 1938, Benjamin laid 10 eggs. Both snakes began to incubate their eggs at once. They abandoned them on 28th June. Conditions for incubating were not favourable. So far all is normal.

Now comes a puzzle. On 9th June 1947, that is nine years after the mating, Benjamin laid sixteen eggs. Most of them were immature, hard, discoloured; five of them were perfect in shape and size and covering, and differed in nothing outwardly from perfect python eggs. On 1st August 1947, Benjamin laid one egg, immature, 7 inches in circumference round the centre, 9 inches round the ends. To my certain knowledge no male python has been in the cage since April 1938.

The Fauna of British India, Reptilia and Amphibia, Vol. III Serpentes, 1943, page 21, has a few remarks which may be a clue to the solution of the problem, and may suggest a line of investigation. 'Kopstein discovered that it was possible to have successive layings of fertile eggs without re-mating. An isolated female laid 4 eggs on 5th May 1934, and 4 more on 1st January 1935. American writers show that the spermatozoa can be retained in the uterus for several months.'

In the present instance the spermatozoa seem to have been retained for nine years.

LOYOLA COLLEGE,
CATHEDRAL P.O.
MADRAS.
31*st August* 1947.

REV. C. LEIGH, S.J.

[There is nothing to show that the eggs laid by python Benjamin nine years after mating were fertile. The laying of eggs by caged female birds (e.g. parrots) after many years of solitary confinement is well known. All eggs so laid are of course sterile. Might not this same phenomenon be applicable to reptiles believed to be the phylogenetic ancestors of birds? And why does the writer presume that the spermatozoa in this case may have been retained for nine years?—EDS.]

23.—NOTE ON THE BULL-FROG (*RANA TIGRINA*) EVERTING LUNG

On the 10th June (1946), I caught a Bull-Frog. When handled, it inflated itself to capacity in the usual defensive way. The pulsation of the throat ceased, except for an occasional effort of 'swallowing' (air). By constant handling, I kept the animal in this tense condition for about 10 to 15 minutes. When shaken one could easily hear and feel the viscera moving about inside. Finally, the animal everted its left lung which was full of air. The lung measured approximately 4″ × 2½″ in the distended condition. The lung was evidently forced out by the internal air pressure. This curious incident surprised me as I had never witnessed such behaviour before. I put the animal on the ground, and the everted lung left a blood stain on the floor. The frog now deflated itself, and its lung, and with the alternate use of its fore-legs it pushed the lung back into its mouth and 'swallowed' it! After it had replaced its lung, the animal remained quiescent for a while, and then moved off as if nothing had happened. About two hours later, I saw the animal, but it seemed none the worse for its experience.

BOMBAY NATURAL HISTORY SOCIETY, C. McCANN
11*th June* 1946.

24.—CULTURE OF MURRAL FISH (*OPHICEPHALUS MARULIUS* HAMILTON) IN IRRIGATION WELLS [1]

Ophicephalus marulius, locally known as *Aviri*, is common in the Bhavani and Cauvery rivers flowing through the Coimbatore and Salem districts. In these rivers the fish attains a maximum size of four feet. It prefers deep river sections with sandy bottom and submerged rocks. It attains maturity at the size of 12 to 14 inches. It breeds from March to June and from October to December, when there are no floods. Like other members of the family *Ophicephalidae*, this species also shows parental care by building nests at the time of breeding. The nesting place is a sheltered weedy river margin, where the depth is not more than four feet, with overhanging trees and shrubs. The temperature of water in the breeding area ranges between 28° and 31°C. The cup-like nests are constructed by inter-weaving stems and blades of water weeds, particularly *Vallisneriā spiralis* Linn. at a distance of about two feet from the river margin. The number of fry in a brood is about 500; and they are golden yellow in colour. Both the parents take equal share in the guarding of their nest and young ones. When the fry are one inch in size, black pigments appear on the dorsal and ventral sides, leaving a yellow band along the lateral line. They do not swim beyond a distance of two yards from their parents, and take shelter in the nest at the least disturbance of the water. The parental care is discontinued when the young ones have attained a size of four inches.

The ryots of the district collect the fingerlings and stock them in their irrigation wells, at the rate of about 100 in each well. These fingerlings are fed with live minnows and frogs, and dead birds and rats, and with kitchen refuse. The fish attain a size of 1½ feet within one year, but only about ten per cent of their original number survive. This may be due to their cannibalistic habit. The ryots capture the grown up fish by angling with a live minnow or frog as bait, for consumption as delicacy on important occasions. The stocking operation is repeated annually. As a result of rural fishery demonstration work in the Madras Province, ryots in other districts, such as Chingleput and South Arcot, have been induced to take to culture of this species in their swampy irrigation tanks and wells, which are difficult to be cleared and used for carp culture. The fish is tenacious of life; and consignments of fingerlings, two inches in size, have been transported over distances of 400 miles without any casualty and without effecting change of water in the carriers *en route* more than once.

---

[1] Communicated with the kind permission of the Director of Industries and Commerce, Madras.

INLAND FISHERIES OFFICE,
8, ORMES ROAD,
KILPAUK, MADRAS.

P. I. CHACKO
G. K. KURIYAN

25.—A LARGE BLACK ROCK SCORPION

(From *The Field* 12–4–1947. p. 351)

I was interested in the photograph of Capt. D. W. Miuntrie's black scorpion. Readers may be interested to know that I forwarded to a military hospital for scrutiny, a black scorpion with an overall length of 11½ inches, which was discovered under a rock in the village of Krishnarajapuram, S. India. This indeed seemed an outsize

70A, LAKENHEATH,
SOUTHGATE, N. 14.

S. G. BURGESS

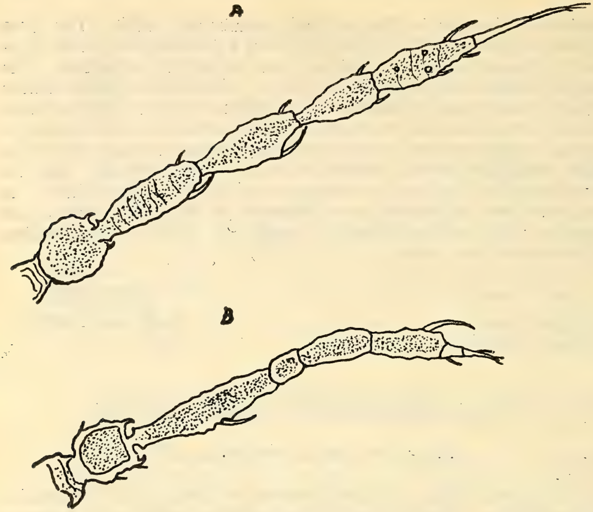
[The above extract was sent to us by Mr. R. F. Stoney. The specimen referred to is probably *Palamneus swamerdami*. There is a specimen 9¾ inches long in the Society's collection.—EDS.]

26.—AN ANOMALOUS ANTENNA IN *RHIPIPHOROTHRIPS CRUENTATUS* HOOD. FROM TAMBARAM, SOUTH INDIA

(*With a text-figure*)

Two female specimens of *Rhipiphorothrips cruentatus* were collected from the flowers of a shrub *Lagerstroemiā indica*, in Tambaram. The right antenna in one of the specimens shows an anomalous type, while the left one is normal. The third antennal joint in the anomalous type is longer than usual, the fourth very much reduced, the fifth and the sixth with variations in shape and the antennal style is also reduced.

Such anomalous antennae have been previously noted and described by Karny. (Ent. Mem. Dept. Agri. India 1926) from rose leaves.



Anomalous antenna in *Rhipiphorothrips cruentatus*
A. Normal antenna ; B. Anomalous antenna.

But the present type differs very much from the described by Karny.

Length of antennal segments. (*in Microns*)

—	I	II	III	IV	V	VI	VII	VIII
Normal	20	40	68	66	50	61	33	20
Anomalous	21	41	96	20	47	41	11	18

MADRAS CHRISTIAN COLLEGE,
TAMBARAM, CHINGLEPUT DIST.,
11*th September* 1947.

T. N. ANANTHA KRISHNAN,
B SC. (HONS.),
Lecturer in Zoology.

27.—MIGRATION OF THE BUTTERFLY *APPIAS ALBINA DANADA*

Some time ago some notes were published in the Journal about butterfly migrations. The followiog information may therefore be of interest. We have had a spell of very heavy rain here for over a week and it has been continuously cloudy and dull. During this period a very big emergence of *Appias albina danada* has apparently taken place. Yesterday the weather cleared and the sun came out. At about noon, I noticed several specimens of the above species flying past my window and looked out. It was then apparent that a large scale migration of this species was taking place. My bungalow stands on a ridge about a thousand feet or so above the valley of the Diyung river and the ascent is steep. There is a narrow valley leading down to the river and the swarm was using this valley. The valley runs more or less north and south and the butterflies were coming up the valley, i.e. flying southward. There is a considerable difference in temperature between the valley of the Diyung which is hot and the ridge above, but I cannot say if this has any bearing on the matter. The stream of butterflies was continuous up to 4-15 p.m. when heavy rain commenced and they stopped. There was however an interruption at about 1-15 p.m. for about ¾ of an hour during a shower when large numbers of the butterflies began settling under the leaves of bushes and shrubs which incidentally enabled me to catch a good series. There was half a gale blowing at the time and the butterflies were all flying steadily up wind and against the very heavy wind, resulting in their flight being very slow and laborious but none of them attempted to turn back and fly down wind. The density was about 35–40 per minute and sometimes they flew singly, but usually six or seven specimens came up one behind the other in a sort of 'follow my leader' string. In each 'string' there were one or more females and more than once I noticed a female following a male. There was no sign of it being a mating flight of any sort. There was no check in the stream and no sign of the males paying any attention to or chasing the females. The whole flight kept purposefully flying southwards. The females appeared to be slightly in the majority. After reaching the top of the ridge the wind caught them but only slowed their flight slightly. I was not able to see where the flight continued to but it must either have continued south-east along the ridge or down into the valley again on the other side. Except for one female of *Appias indra indra*, which I caught, I saw no other species in the flight except *Appias albina danada*. Almost all the females were of the *principalis* form but about one in four was of the *semi-flava* form since out of 15 females caught four were of this form. All the specimens obtained were freshly emerged.

I have once before also noticed a migration of this butterfly in somewhat similar circumstances. This occurred at Cherrapunji in the Khasia and Jaintia Hills in 1944, when many specimens were observed flying westwards up out of a very deep wide gorge but the migration on that occasion was on a much smaller scale and consisted almost entirely of males. Moreover they allowed themselves to be diverted by flowers occasionally which was not the case yesterday.

HAFLONG, R. E. PARSONS, F. R. E. S.
N. C. HILLS, ASSAM. *Indian Police.*
30*th May* 1947.

[In a subsequent letter, dated 23rd June 1947, Mr. Parsons writes ; 'I notice from my diary that after I wrote to you we had several days of heavy rain which drove the butterflies under cover but the migration continued on almost, but not quite the same scale on 2-6-1947, and in the same direction. The migration was greatly reduced on 3rd June and by the 6th, except for odd specimens, had ceased. Instead, the species was congregating in small numbers, both males and females, on the flowering heads of *Leea* bushes and moving about more or less aimlessly. It is curious that both migrations of this species I have witnessed have been up steep hillsides and against heavy winds.'—EDS.]

28.—OBSERVATIONS ON THE HABITS OF THE CONCHOSTRACAN *CAENESTHERIA* SP. RECORDED FROM TAMBARAM (S. INDIA).

The writer records some of his observations on this genus, on whose habits much is not known. He believes that this little piece of information, might prove to be useful to those who are interested in phyllopods.

This bivalved Conchostracan *Caenestheria* sp. recorded from the fresh water lakes of Tambaram, measuring about 2.5 to 4.5 mm. in length, is found in large numbers during the months of September and October, a time when the lakes are not full. The habits of these animals which suddenly go down in numbers after heavy rains, are very interesting. They can be seen burrowing in the muddy soil near the shores of the lake and by the aid of the characteristic elliptical openings on the muddy shores, their position can easily be located. Very often they are to be found swimming in the waters near the shore, with their shells slightly opened, and protruding their leaf-like legs, by the aid of which they propel themselves in the water. But they have a limited range of movement because they are not to be found swimming in places where the water is more than three or four feet deep, and at the slightest provocation they sink down and burrow themselves in the mud.

These animals feed on diatoms and water weeds which grow in large numbers by the shore. The water weeds found in the lake are usually species of *Chara*, *Nitella*, *Limnophyla*, etc. When reared in the laboratory in a trough of fresh water, wherein mud and water weeds from the lake were put, these creatures were found to live for some weeks.

Yet another interesting feature to be noted about these Conchostracans is that they are very active by day and cease to be active sometime after sunset. Rarely do we come across them swimming actively a little while after sunset.

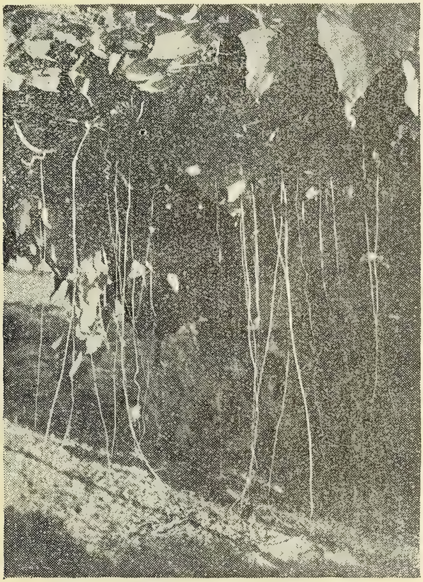
The writer is greatly indebted to Dr. Chopra of the Zoological Survey of India, for having been kind enough to identify this genus. His thanks are also due to Dr. Joshua of the Madras Christian College, for having allowed him to carry on his observations in the laboratory.

MADRAS CHRISTIAN COLLEGE
TAMBARAM, T. N. ANANTHA KRISHNAN, B.SC. (HONS.),
23rd May 1947. *Department of Zoology.*

29. AERIAL ROOTS IN THE SPONGE GOURD, *LUFFA* SP.

(*With a photo*)

Most of the plants with a trailing habit occupy an extensive area. In order to supplement the water-supply and anchorage, the nodes have a tendency to develop adventitious roots which strike the soil and form a small root system. In the climbing forms the development of such roots from nodes placed higher up from the soil level, has not been recorded. It was observed that certain varieties of *Luffa acutangula* Roxb. and *Luffa aegyptiacā* Mill. develop such roots from aerial nodes at various heights. The photo presents a conspicuous view of such adventitious roots.



Aerial roots in *Luffa aegyptiaca* Mill.

Usually a single root emerged from each node in an extra-axillary position. In some cases more than one root (2 to 7) emerged from each node but only a few developed. They were observed to branch either after emergence or on reaching the ground or just after penetrating the soil. In the last case a network of root system was formed. Their colour in the aerial part was green like the stem which turned brown in a later stage, but underground parts resembled the ordinary roots. They were smooth and circular. Their cross section showed radial arrangement of vascular bundles. The anatomical study revealed a large number of vascular bundles in parts near the stem and comparatively a smaller number near the growing tip. Their length varied from 4 to 6 feet from the node to the ground. They elongated showing geotropic response. Their elongation was favoured by damp and cloudy weather during rainy season. Ordinarily the maximum elongation occurred during the night, and it took hardly a week for the developing roots to strike the ground under favourable circumstances.

BOTANY SECTION,
GOVT. AGRI. COLLEGE,
CAWNPORE,
1*st May* 1947.

SURENDRA NATH SINGH,
M.SC. (AG.)

30.—ABNORMAL PALMS OF SOUTH TRAVANCORE

II. A THREE-CROWNED COCONUT PALM

(*Cocos nucifera* L.)

(*With a plate*)

Branching in palms is a very rare phenomenon. Jacob (1) Davis (2) and Srinivasan (3) have recorded arecanut (*Areca catechu* L.) and palmyras (*Borassus flabellifer* L.) each having more than one crown. Presley (4) has found that the Florida Silver palms (*Coccothrinax garberi*) have produced true shoots. The appearance of this characteristic trait in a single species, he says possibly represents an example of a mutational change in reproductive physiology. True dichotomous branching occurs in the palms of the genus *Hyphene*, Blatter (5). In the coconut palm (*Cocos nucifera* L.) cases of stem fasciation are reported by Jacob (6) and Yegnanarayana (7). Fertility trials were conducted on branched coconut palms by Burkill (8) and Furtado (9). Shortt (10) reports of coconuts branching at the base. Ridley (11) who had observed a bulbulliferous coconut, reports it as a branched one since the bulbils resembled branches. In this connection it is interesting to recall the bulbulliferous coconut palm observed by Davis (12) which is being published elsewhere[1] which has given rise to branched bulbils instead of simple ones as reported by Ridley. Distinct and healthy two-crowned coconut palms are reported by Wray (13) and Yegnanarayana (7), the crowns of which bear fertile fruits.

Description of the palm:

Plate (I) shows an old coconut palm growing near Kulasekaram, which is near Pechipparai dam of South Travancore. The palm is quite normal up to a height of nearly fifty feet from the soil. At this place the main stem has branched into two, almost dichotomously.

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[1] In this Journal, Vol. 47, No. 3 (April 1948).—EDS.

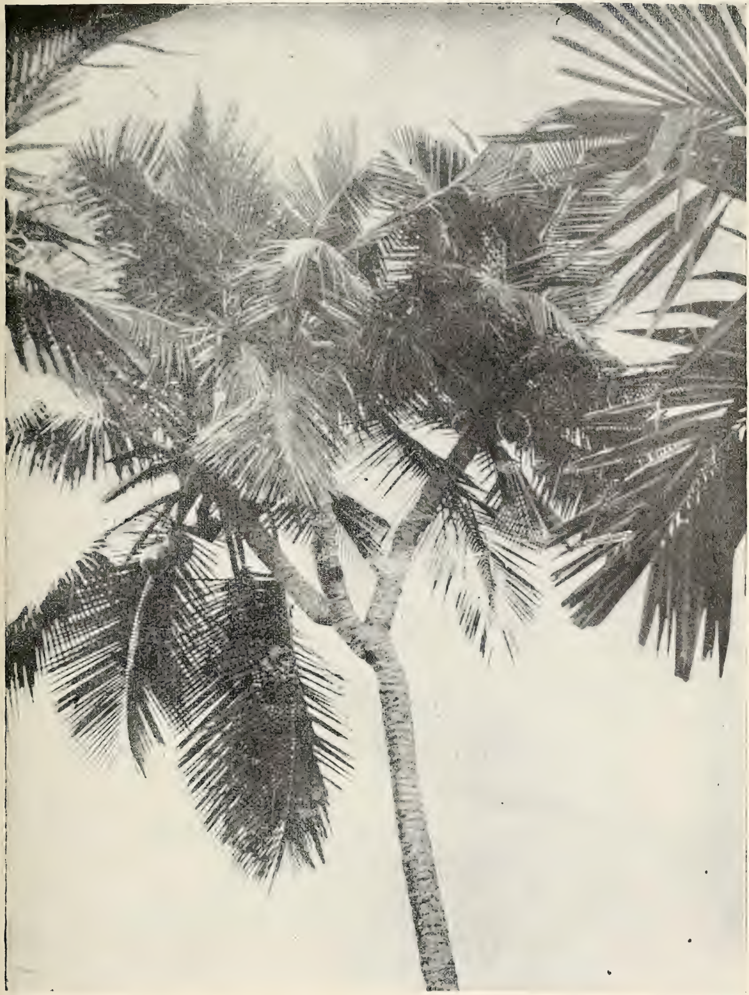

Photo by *T. A. Davis*

A three-crowned coconut-palm (*Cocos nucifera* L.)
Kulasekaram, South Travancore.

The exact cause of this phenomenon is not known. Yet the past history of the palm is of remarkable interest. Some local people say that the palm at this particular height was attacked by the 'determined ravager', the Rhinoceros Beetle (*Oryctes rhinoceros*) which causes incalculable loss to the coconut growers. This affliction might have resulted in the stimulation of the apical meristem which might have continued its growth in two directions resulting in the production of two branches. However, traces of the beetle attack are not clearly visible now which may be probably due to age. Still another interesting thing has happened very soon after, viz., the branch on the left has divided into two from nearly two feet above the original junction. This branching does not resemble a true dichotomous one. This also may be attributed to further attack of Rhinoceros Beetle or as some other local ryots say, due to the after effect of lightning which had struck the palm partly. Field (14) also mentions a similar happening in a wild Date palm which had given rise to many branches.

The three branches of this coconut palm are quite healthy and the individual stems are almost as stout as the original stem. The branching of this palm is very clear and distinct. All the three branches bear healthy and normal fruits (see plate I) which is not the general case in fasciated palms.

Discussion and conclusion:

True branches, as a rule arise from the axils of leaves or their other modifications. The production of shoots from roots, root tubers, leaves, etc., are rare exceptions. In dicotyledonous plants axillary as well as in some cases accessory branches are common both of which are entirely absent in palms. Ridley (11) calls the bulbils of an abnormal coconut plant which arise from the axils of leaves, as true branches. No doubt the bulbils are homologous and analogous with branches. Still the present writer dissents to call the simple bulbils reported by Ridley or the compound (branched) ones observed by Davis (12) as true branches, since they wither and fall off after few years of attachment to their mother plants.

The branching in these palms is not a hereditary trait and hence their offsprings fail to imitate them. The appearance of true shoots in the Florida Silver palms represents an example of a mutational change in reproductive physiology according to Presley (4). True genetical bearing is met with in the dichotomus branching of the genus *Hyphene* and the offsprings of these palms continue the same kind of branching hereditarily.

The branching of this particular coconut palm is also a true dichotomous one resembling the branching of some cryptogamic plants. The first division is obviously a dichotomous one. Also the second division of the branch on the left one is due to the division of the apical meristem since the two branches resulted from this division developed simultaneously and are equally aged. To confirm this the leaf scars of the two branches above the junction were counted and in both the number of scars were almost the same.

Some call the fasciated palms as branched ones. These give rise to a crowded and confused mass of shoots from the flattened stem.

The branches are generally of unequal size and thickness and they develop at irregular intervals. Most of these fasciated palms remain sterile without fruiting or flowering. These palms cannot be correctly considered as branched ones.

The abnormal branching in palms is either due to inexplicable physiological changes or to external stimulations. Their mode of branching does not resemble a normal one and they do not follow a definite order. This particular palm is highly interesting in the sense that it has got distinct and dichotomous branches which are healthier and almost as stout as the original stem. All the branches bear fertile fruits.

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DEPARTMENT OF BOTANY,
MADRAS AGRICULTURAL COLLEGE
AND RESEARCH INSTITUTE,
COIMBATORE,
SOUTH INDIA,

13*th September* 1947.

TRUPAPUR A. DAVIS,
Research Student.

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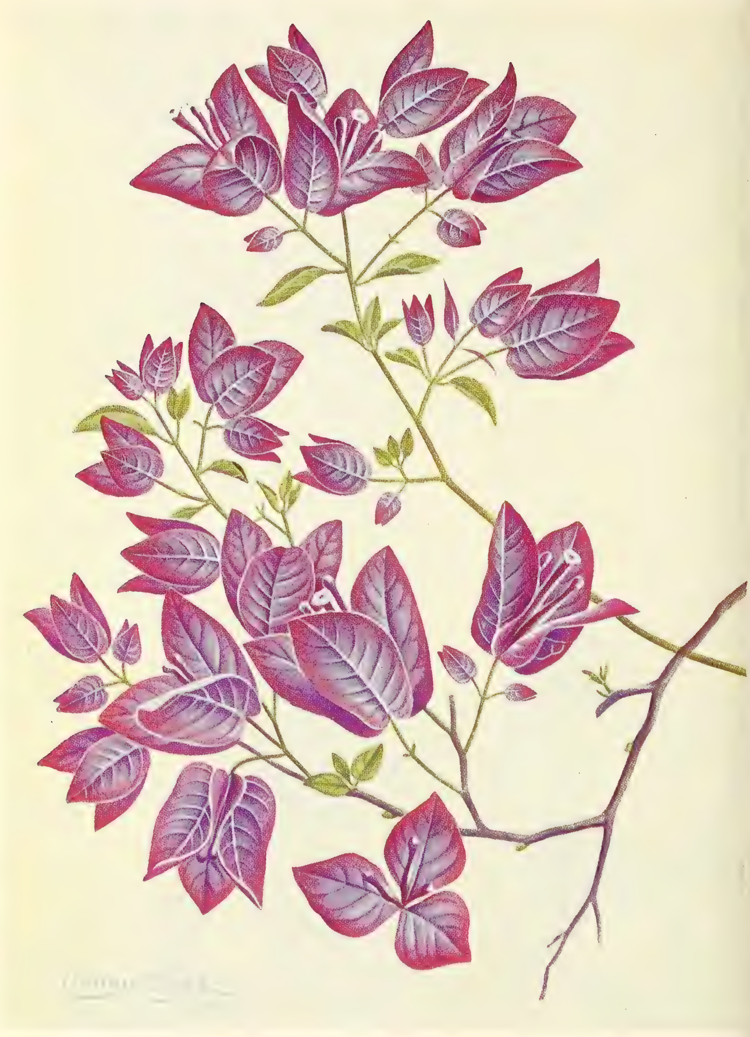

BOUGAINVILLEA GLABRA Choisy
(2/3 natural size)

JOURNAL

OF THE

Bombay Natural History Society.

1948. VOL. 47. NO. 3

SOME BEAUTIFUL INDIAN CLIMBERS AND SHRUBS.

BY

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PART XXVIII.

(*Continued from Vol.* 47, (1947), p. 196).

(*With one coloured and* 4 *black and white plates*).

Nyctaginaceae

This family is important in Indian gardens because one of its genera is the far-famed *Bougainvillea,* so commonly cultivated nowadays. The family comprises herbs, shrubs and trees. The flowers may contain only the male sexual element or the female, or both may be combined in one flower. A brightly coloured involucre of bracts often surrounds the flower or group of flowers and is usually taken for the calyx. The actual calyx is tubular. This again is often taken for the petals which are, however, absent. The stamens are usually many but are sometimes reduced to one, inserted below the ovary, which is 1-celled and ends above in a slender style. The ovule is solitary within the ovary and inverted.

Another common plant belonging to this family which is found in Indian gardens and also running wild is *Mirabilis Jalapa* more usually

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known under its popular names Marvel of Peru or Four-o'clock Plant. This South American species is now cultivated everywhere in the tropics and its magenta coloured perianth makes a striking patch of colour. The flowers only open in the evening and this fact gives rise to the trivial name. The scientific name of this plant preserves the erroneous belief, at one time widely held, that the tuberous roots were identical with those of the true jalap. The jalap is a renowned purgative, so drastic and powerful in its effects, that it has been suggested that 'jalap' and 'faith' are synonymous. Be that as it may, the purgative effect of the roots of *Mirabilis* are very mild, though a decoction of the roots is said to possess curative powers in a variety of diseases and disorders ranging from dysentery, cholera and diarrhoea on the one hand to constipation on the other!

The genus, however, with which most Indian gardeners will be familiar is—

Bougainvillea Commerson.

This genus was published by Commerson, the French botanist in 1789, in honour of L.A. de Bougainville, the famous French navigator, based upon specimens collected in Brazil during de Bougainville's voyage round the world in 1766-69. The name as published by Commerson was *Buginvillea* but the correct spelling as adopted in the Index Kewensis Suppl. 9, 1931-35 is *Bougainvillea* Comm. corr. Spach. In between these dates the name has been spelt in half a dozen different ways.

The species of the genus, amounting in all to some fifteen, are climbing shrubs in their homes in South America. In horticultural practice they can be got to grow as standards and as pot plants and are extremely effective. It is well to remember that the colour of the bracts in some species at the base of the flower-group is very vivid and the magenta shades especially clash with everything else within range. Nothing can, however, be more effective than one of these giant climbers in its natural setting, that is, rambling and cascading over other vegetation in one of the wilder corners of the garden.

The leaves of the species of the genus are simple and alternate. The stem is covered with spurs or spines which aid the plant to climb upon and ascend through other vegetation.

An examination of the 'flower' of *Bougainvillea* will reveal that at the tip of the flowering shoot there are three (usually) brightly coloured leaves or bracts which are heart shaped when flattened. These bracts touch along their margins and give rise to the common belief that they constitute the floral envelope. Actually the true flowers will be found within the floral bracts. These flowers are rarely solitary and usually three of them are seated together within the bracts in an umbel-like structure. Each individual flower is erect upon a pedicel attached to the midrib of the subtending bract near its base.

The true flowers are tubular in shape, greenish-white or cream-coloured, about 3/4 in. long and 1/3 in. in diameter, pedicelled, glabrous or hairy. The tubular perianth is roughly pentagonal in section and terminates in five equal lobes which often present a frilled appearance from lateral outgrowth from the lobes. Within the perianth-tube will be found the stamens, seven or eight in number, the anthers being seated upon long flattened, capillary filaments which are unequal in length so that in a mature flower 2 or 3 anthers will be found emerging from the perianth-tube. Within the filaments is a solitary pistil surmounted by a solitary style terminating in a hairy stigma. The pistil contains a single ovule. Some of the bud sport varieties, e.g. var. *Louis Wathen* have imperfect flowers.

All of the known varieties of *Bougainvillea* are derived from the four species *B. spectabilis* Willd., *B. glabra* Choisy, *B. peruviana* Humb. et Bonp. and *B. Buttiana* Holttum and Standley, but it must be remembered that there is also a host of hybrids. The flowers of *Bougainvillea* are self sterile and in the ordinary course of events seed is very rarely produced. A number of hybrids have been produced by Mr. Percy Lancaster in Calcutta by means of cross pollination. There is likely to be a great advance in the coming years and we may expect a large number of hybrids with tinted bracts of every imaginable colour. All who are interested in *Bougainvilleas* should read the works of Holttum (Malayan Agri-Horticultural Association Magazine) Parsons (Tropical Agriculturist) and Percy-Lancaster (Agri-Horticultural Society of India) from which most of the information in this article is compiled. It is quite impossible to describe all the cultivated varieties of the species of this genus. Not only are some of the species of later hybrids and sports given varietal rank based upon very subtle differences in colour of the bracts, but also the true name of the parent is not always known. It has happened more than once that a variety has been introduced into several gardens in India under different names. Hybrids have been produced from these and the result has been nomenclatural confusion. Again a name used to denote a colour does not always convey the same impression to the reader as it does to the writer and there is the additional difficulty that most of the varieties exhibit a change in colour in the bracts from youth to age. Hence keen gardeners are informed that while chaos has not yet come upon us in the naming of *Bougainvillea* varieties it cannot be long delayed. With the big gardens producing hybrids and the small nurseries following suit, there is bound to come a time when each valid variety has three or four names. We sympathise with our readers but cannot do anything about it.

As has been said above four main species have given rise to the true varieties known in India at the present time.

KEY TO THE SPECIES.

Plant definitely hairy.	... *B. spectabilis*
Plants glabrous or nearly so	
Tip of the floral bracts acute;	
Bracts magenta	... *B. glabra*
Tip of the floral bracts obtuse	
Bracts crimson	... *B. Buttiana*
Bracts delicate mauve pink	... *B. peruviana*

Bougainvillea spectabilis Willd.

Description.—An arborescent shrub climbing over large trees and through other vegetation by means of the curved spines on the stem and branches. Bark pale and corky cracking into rectangular plates. Branches and shoots hairy; very hairy when young. Spines woody, axillary, 1-2 inches long, more or less curved, tomentose or sometimes glabrous. Leaves petioled, ovate or even rotundate in shape, obtuse or shortly acuminate, entire, somewhat wavy on the margins, membranous to somewhat leathery in texture, 2.5-3 in. long, 2 in. wide, sparsely hairy above, hairy to hirsute below. Flower-heads terminal or axillary, seated on peduncles and more or less gathered into branched panicled inflorescence; peduncles simple or sometimes divided. Each flower head consists of three bracts arranged as an involucre and carrying the flower. Bracts purple or rosy purple, ovate in shape, 1.5 in. long, 1.2 in. wide, obtuse at the tip, cordate at the base, membranous in texture, reticulately nerved. The flowers are adnate to the median nerves of the subtending bracts. Perianth tubular, corolla-like, hairy, 1 in. long, ending above in a 5-lobed narrow mouth. Fruit club-shaped, 5-ribbed, glabrous or pubescent.

Distribution.—This species grows wild in the mountainous parts of eastern and central Brazil.

This was the first species of *Bougainvillea* to be introduced to cultivation. A specimen was brought alive to Paris in the eighteen-twenties and flowered in a tropical greenhouse there. It was cultivated in England in 1844 and the plant was well known in India as far back as 1860. The flowering of this species is always seasonal and depends upon the occurrence of dry weather. It is said that only very large plants, especially those grown over tall trees, flower well.

Varieties of **B. spectabilis** Willd.

Var. *lateritia*. This very fine variety is difficult to propagate and is therefore not as common as it deserves to be. The colour of the bracts has been described as brick red or a very fine shade of jasper red, fading to brazil red as the bracts fade. The variety follows its parent in the seasonal flowering and it only bursts into full colour after periods of drought.

Var. *Maharaja of Mysore*. It is not quite certain whether this is a hybrid between *B. spectabilis* var. *lateritia* X *B. glabra* or whether it is a chance variety of *B. spectabilis*. At all events the leaves and other parts of the plant are hairy. The bracts are described as being spinel red to rose dorée in hue, and to change to brick or brazil red with age. It is a fairly free flowering variety and can be propagated very easily.

Var. *Mrs. Frazer*. This variety which is probably a hybrid has bracts which are spinel red in colour turning to eugenia red with age. It again exhibits seasonal flowering and does not do well unless it is placed in a hot and dry position.

Var. *Rosa Catalina*. This distinct variety is known as the 'Pink' Bougainvillea in our Indian gardens. It was introduced into

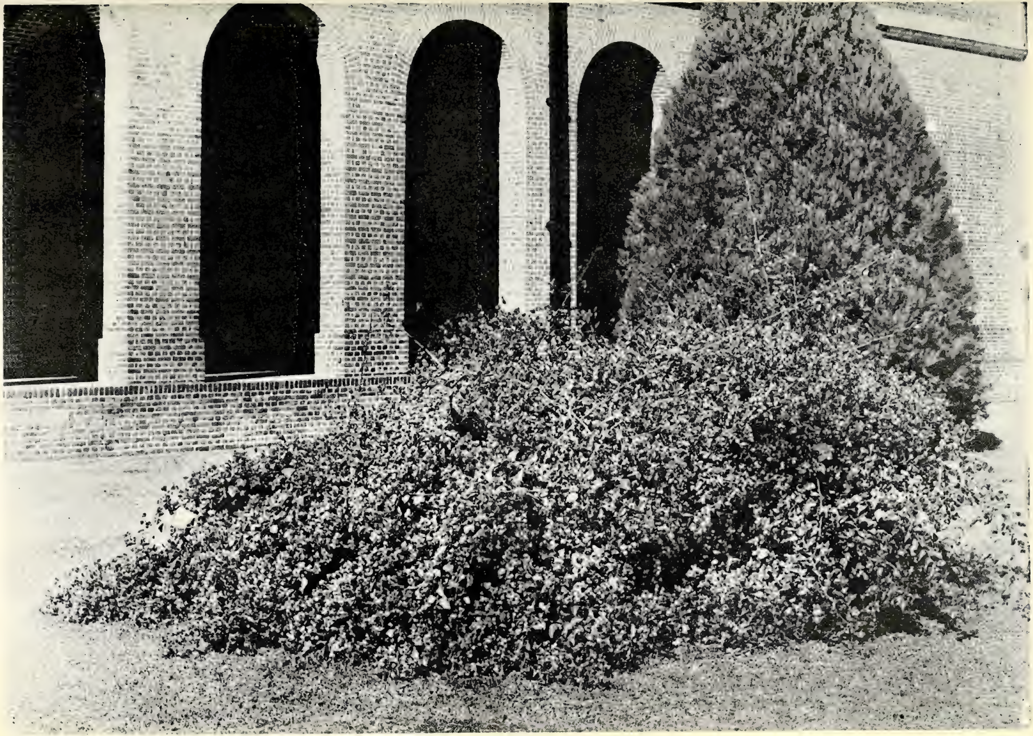

Photo by *M. B. Raizada*

Bougainvillea spectabilis Willd.
var. Maharaja of Mysore.
New Forest, Dehra Dun.

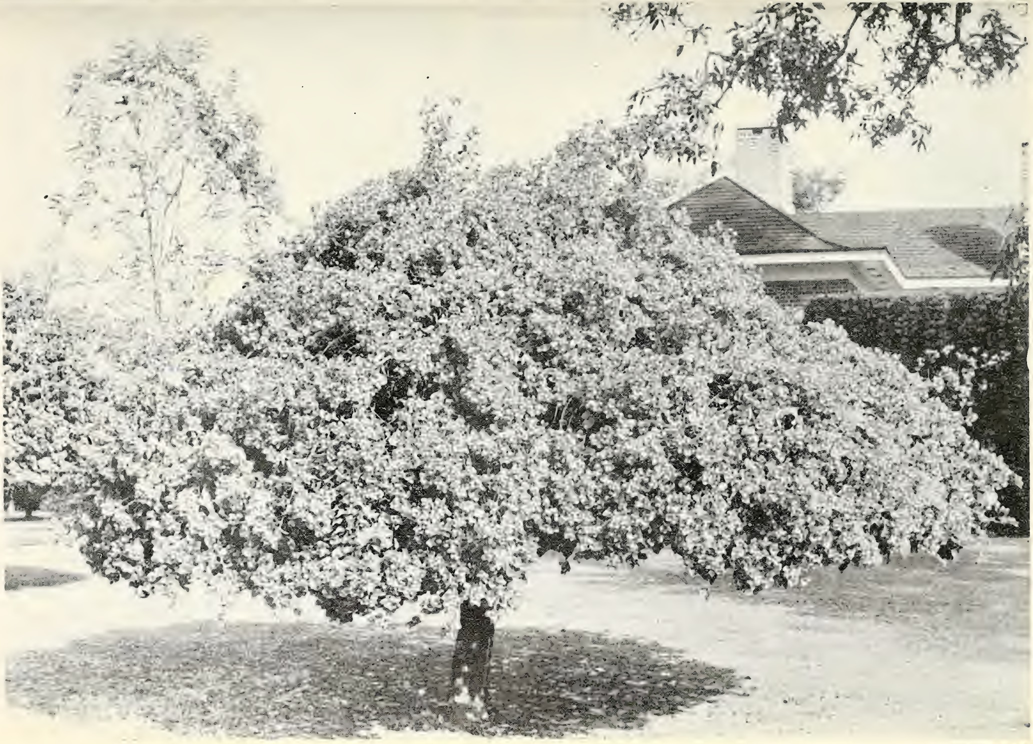

Photo by M. B. Raizada

Bougainvillea Buttiana Holttum & Standley
(B. Mrs. Butt)
New Forest, Dehra Dun.

England from the Canaries and first exhibited in London in 1910. The bracts are spinel red in colour or pale red or a bright rosy scarlet. One advantage of this plant is that the colour of the bracts is capable of harmonising with other flowers in the garden. It flowers more freely than some of the varieties of *B. spectabilis* and deserves to be more widely cultivated. Its propagation is rather difficult.

Bougainvillea glabra Choisy.

Description.—A climbing shrub with leafy, glabrous, spreading, spiny branches. Spines short, scarcely curved. Leaves glabrous on both sides, oblong-lanceolate or ovate-oblong in shape, acuminate, entire, cuneate or cordate at the base, seated on a petiole .2-.3 in. long, 1-2 in. broad, firmly membranous in texture. Flower-clusters arranged in axillary or terminal panicles which are many- or few-flowered. Bracts elliptic or elliptic-lanceolate in shape, cordate at the base, acute at the tip, reticulately nerved, magenta in colour. Perianth tubular, less than 1 in. long, slightly hairy. Fruit turbinate, 5-ribbed, glabrous, .5 in. long.

Distribution.—This plant is at home in evergreen woods on the mountainous parts of Rio de Janeiro and San Paulo.

This climber differs from *B. spectabilis* in being less hairy in all its parts, and more particularly in habit. *B. glabra* flowers almost continuously throughout the year and therefore is of far more value horticulturally than the former species. *B. glabra* arrived and was exhibited in London in 1860, it having come from Brazil by way of Mauritius. This species has been known in India for the past 60 or 70 years and is very common.

Varieties of **B. glabra** Choisy.

Var. *Sanderiana.* This variety has been exhibited over and over again in London and is commonly cultivated in Europe. It is very free flowering and can be grown as a small pot plant. One advantage in north India is that it is able to withstand slight frost. The colour of the bracts is described as phlox purple to magenta.

Var. *Cypheri.* This variety appeared in 1897 and is quite common in the East. The bracts are paler than those of var. *Sanderiana,* but larger, and the flower panicles are produced in large quantities.

Bougainvillea Buttiana Holttum & Standley.

Description.—A widely climbing spiny shrub of open growth. The stem and other parts are usually hairy when young but become almost glabrous with age. Leaves deep green in colour, ovate-rotundate or elliptic ovate in shape, 5-6 in. long by 4 in. wide, acuminate at the tip, truncate or rotundate at the base, usually with some hairs even when old.

The inflorescence is lax and few-flowered. The flower clusters are seated on glabrous peduncles about 1/3 in. long. The bracts are rotundate-elliptic or ovate-orbicular in shape, crimson in colour, upto 1.5 in. long by 1.5 in. broad, rotundate or broadly obtuse at the tip, broadly rotundate, or somewhat cordate at the base, glabrous or occasionally minutely hairy on the veins, reticulately nerved. Perianth about 3/4 in. long very minutely hairy to almost glabrous.

Distribution.—The species is supposed to be Brazilian in origin.

This magnificent plant had an interesting history which has been so well summarised by Mr. Holttum in Malayan Agri-Horticultural Association Magazine April 1941 that it is reproduced here verbatim.

'How long this *Bougainvillea* has been cultivated in South America in unknown. The first recorded item of history is that Mrs. R. V. Butt, of Trinidad, visiting Colombia in 1910, found a plant in a garden near Cartagina, and brought cuttings to Trinidad. It was found easy to propagate and was soon distributed to the other West Indian islands.'

'In October 1916 the U.S. Department of Agriculture recorded the introduction from British Guiana to Florida of a crimson flowered *Bougainvillea* of which sufficient information is given to make its identity with *Mrs. Butt* certain, though that name is not mentioned. But it seems that the species had been introduced into Florida at an even earlier date.'

'It seems that this *Bougainvillea* did not cross the Atlantic until after the 1914-18 war, and then it was introduced to Europe both as Mrs. Butt and as Crimson Lake.'

'The next item of history comes from India. Mr. Percy-Lancaster, Secretary of Royal Agri-Horticultural Society of India, informed us that a *Bougainvillea* resembling Mrs. Butt arrived in India direct from the West Indies in 1920. Mr. Percy-Lancaster gave the name "Scarlet Queen" to this plant. He writes "The coloured bracts are slightly darker than in Mrs. Butt but the actual flower is malformed so that instead of there being three white or cream flowers in the bracts, there are merely little bunches of anthers. In growth and foliage these plants are identical. The original Scarlet Queen gave rise at Madras in 1932 to a bud sport with orange bracts which was called 'Louis Wathen'. Mrs. Butt was soon distributed from Kew to the eastern tropics and to Africa. In 1931 in the garden of Mrs. McLean of Trinidad, a plant of Mrs. Butt produced a branch with apricot-orange instead of crimson bracts. This was shown to Mr. R. O. Williams, who propagated it and called it 'Mrs. Mc Lean'. The next year the variety Scarlet Queen did the same thing in Madras, in the garden of Mrs. Wathen, and the orange variety so produced was called 'Louis Wathen' by Mr. B. S. Nirody, Honorary Secretary of the Madras Agri-Horticultural Society. Mr. Nirody actually said that Louis Wathen was derived from Mrs. Butt, but Mr. Percy-Lancaster in his letter on Scarlet Queen informed us that the latter variety was concerned. This statement is borne out by the fact the 'Louis Wathen' can be distinguished from 'Mrs. McLean' by its imperfect flowers. I know of no other distinction between the two. To be quite accurate, Louis Wathen does occasionally have a perfect flower, which one may see as a little cream coloured star, among the orange bracts, but most of the flowers lack the white star-like end entirely, the remainder consisting of an inconspicuous group of stamens protruding from a short tube." '

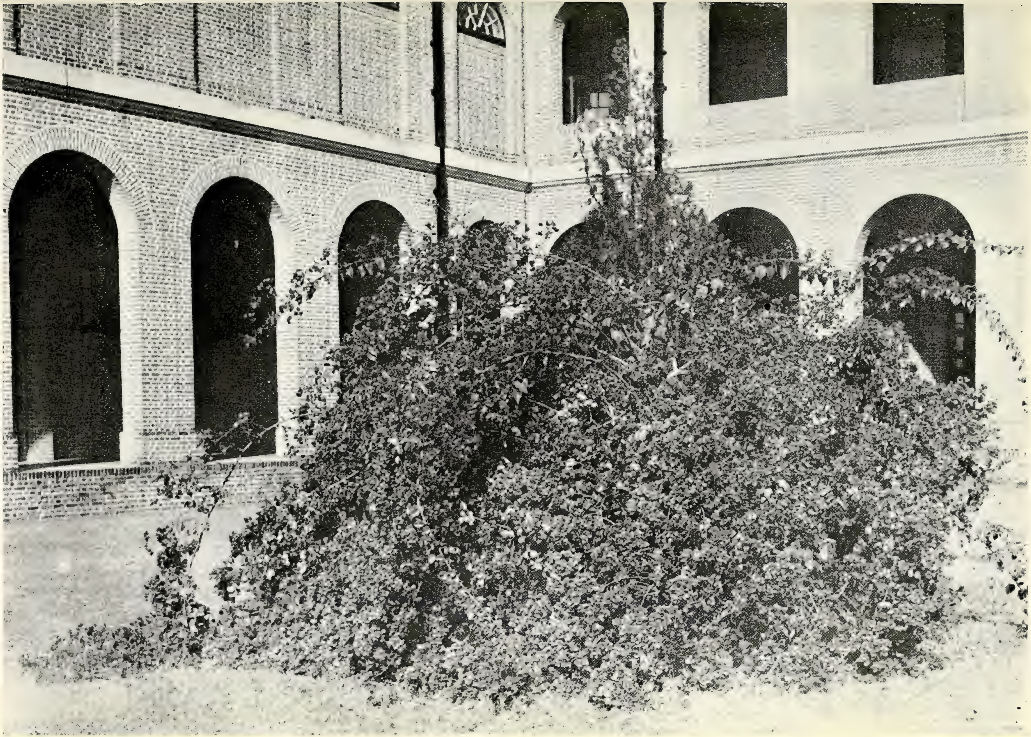

Photo by M. B. Raizada

Bougainvillea spectabilis Willd.
var. *lateritia*.
New Forest, Dehra Dun.

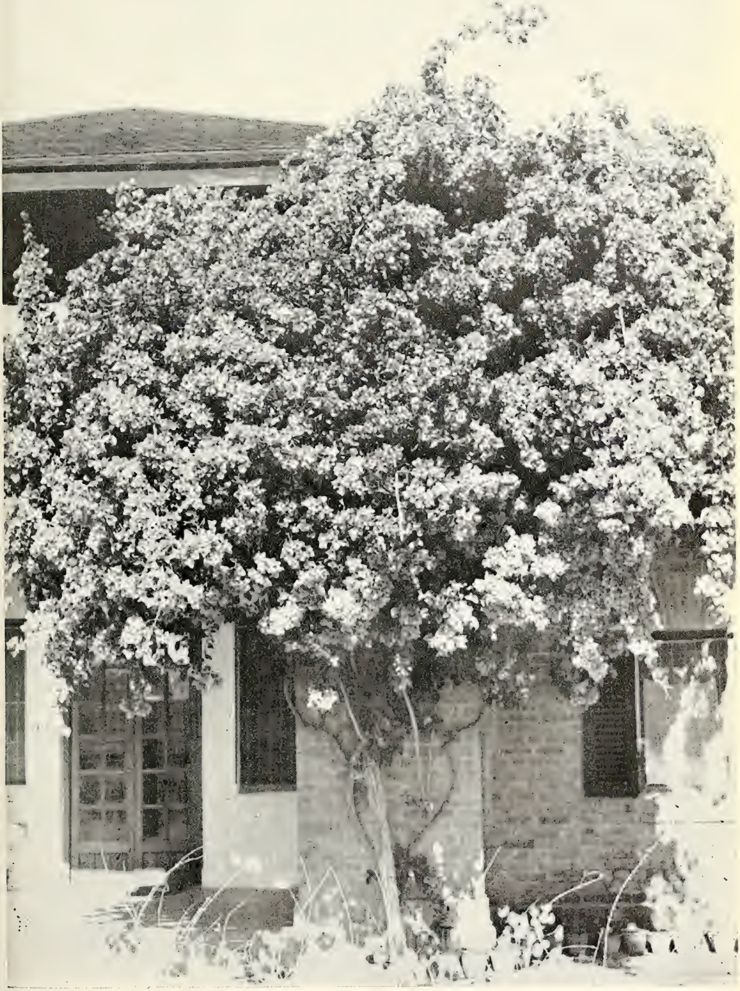

Photo by M. B. Raizada

Bougainvillea glabra Choisy.
New Forest, Dehra Dun.

'Mrs. Butt, like *Bougainvillea peruviana* is evidently native of more tropical regions than the original purple *Bougainvilleas* which were found in the south of Brazil, on the borders of the tropics. It has also a quite distinct habit, with its stronger, more open growth, very broad leaves and close branches of flowers. It is needless to describe in detail its many well-known qualities, but will point out two facts which have not, so far as I know, appeared in print.

The bracts of Mrs. Butt and its derivatives turn from crimson or orange when young to purple or mauve as they grow older but the bracts of the orange varieties (var. *lateritia* and hybrids) of the older *Bougainvilleas* start purple when they are young and pass through red to orange when they are old. The other feature of Mrs. Butt is one of which gardeners should beware. It will not stand hard pruning back so that no leafy shoots are left. The old purple *Bougainvilleas* can be cut back almost to the ground, and they rise again more vigorous than before, but Mrs. Butt will not stand rough treatment.'

The varieties, var. *Mrs. McLean* and var. *Louis Wathen,* are very common in Indian gardens and their history is given above. As stated, it is not certain that var. *Louis Wathen* is actually a variety of *B. Buttiana* since the origin of Scarlet Queen is not known, but if the only difference between the two, *Louis Wathen* and *Mrs. McLean,* is the presence of imperfect flowers in *Louis Wathen,* the two plants surely have a common origin.

Bougainvillea peruviana Humb. et Bonp.

Description.—A climbing, spreading, spiny shrub. The branches are covered with a greenish bark and bear spines which are straight when young but become curved when old. This species is said to lose its leaves entirely each year. The leaves are quite glabrous, alternate, ovate in shape, upto 4 in. long by 3 in. wide, entire, acute at the tip, cuneate at the base, thin in texture, seated on very slender petioles. Flower-clusters panicled in the axes of the leaves. Bracts ovate-obtuse, upto 1 in. long by 3/4 in. wide, delicate mauve pink in colour. Perianth tubular, much more slender than that in any other of the species, quite glabrous except for a few hairs on the subtending bracts, ending above in a 10-toothed limb, of which 5 teeth are longer, entire, while the 5 are broader, 2-fid, yellowish in colour. Stamens 7 shorter than the perianth. Fruit oblong.

Distribution.—The home of this plant is said to be Peru, Colombia and Ecuador.

Again Trinidad seems to have been the scene of the first introduction of this species, when a Mrs. Rover in 1920 brought back a specimen to the island. It was introduced into Florida about 12 years afterwards and is a recent acquisition in the East. There are two varieties.

1. var. *Lady Hudson.*
2. var. *Princess Margaret Rose.*

The two varieties are very similar, the latter has longer bracts (upto 1¼ in. long as against 1 in. in Lady Hudson) of a decidedly deep shade of pink. Both varieties do well in pots.

General Notes on Gardening.

Bougainvilleas form one of the most prominent and prolific sources of colour in tropical gardening and are deservedly very popular. They flower a great part of the year and are invaluable in providing broad colour effects in the garden. But most of the magenta coloured varieties are apt to kill other colour effects when planted in a small garden. They, however, look very charming against a background of green and are consequently suitable for climbing any large tree on the borders of the compound. In large gardens and parks they are useful particularly for boundary hedges, arches, pergolas, up tall trees, and look spectacular rambling down a grassy slope. Grown as an isolated shrub on a lawn they are exceedingly decorative. They can also be grown as standards and for this purpose *Mrs. Butt* and *Louis Wathen* are very suitable. Almost all the varieties stand pruning with impunity and are used particularly in southern India as a hedge. *B. glabra* and *B. spectabilis* are types commonly used for this purpose.

Bougainvilleas thrive in almost any kind of soil and will grow with ordinary care almost anywhere except at hill stations. They are, however, most luxuriant between 2,000-4,000 ft. above sea level. They essentially love full sunshine and thorough drainage. An occasional top dressing and periodic manuring is all that is necessary in later stages of growth. The majority of the varieties are propagated by cuttings or by layering or gootee, but certain varieties like *lateritia*, *Rosa Catalina* and *Louis Wathen* are not easy to propagate and strike root with difficulty. The usual method is to select well ripened shoots of the previous season's growth. Cuttings 9-10 inches long and a pencil thickness are selected and inserted in beds of sandy, well drained soil. Most of these take roots in 4-5 weeks from the time of insertion. Those varieties which fail by this method should be either layered or gooteed and when sufficiently rooted they are transplanted into larger containers and kept there for some time before finally planting out.

Though *Bougainvilleas* will grow in almost any kind of soil they require a certain amount of manure and humus in the early stages of growth. Later on periodic top dressing of manure and clean weeding immediately round the plant is all that is required in the way of after treatment.

(To be continued)

THE BIRDS OF THE SIMLA AND ADJACENT HILLS

BY

A. E. JONES, M.B.O.U. (deceased).

PART III

(*Continued from page 249 of this volume*)

123. **Dicrurus macrocercus albirictus** Hodgs. The Black Drongo or King Crow.

LENGTH : 13 inches.
FIELD CHARACTERS : Sexes alike; entire plumage black glossed with blue; often with a white spot at the gape.
DISTRIBUTION : This race is a summer visitor to the Simla Hills from 2,500 ft. to 6,000 ft. With other races spread all over the Plains.
GENERAL HABITS : A bird of the open country near cultivation and the edge of light forest. Commonly seen on the telegraph wires or some other conspicuous coign of vantage. Bold and fearless, it doesn't hesitate to attack crows, hawks and even eagles should they venture near its nest. It also quite frequently perches on the backs of cattle and goats, I even saw one seated on the back of a cultivator as he was planting out rice seedings (Gorakhpore).
NIDIFICATION : Most nests are found in May and June. They are shallow cups made of fine grass and spiders' web bound to the bifurcation of a bough at varying heights from the ground from 10 feet to 40 feet. There is no attempt at lining and not much as regards concealment. The eggs number three or four; they vary in colour from white to pinkish cream, sparsely blotched with black or reddish-brown.

124. **Dicrurus longicaudatus longicaudatus** Jerdon. The Indian Grey Drongo.

LENGTH : 12 inches.
FIELD CHARACTERS : Sexes alike. Upper plumage black glossed dark blue, lower plumage dark grey.
DISTRIBUTION : Also a summer visitor to the Hills arriving at the end of March, leaving these parts September and October. Ascending to a height of 8,000 ft.
GENERAL HABITS : A forest bird, it will be found also on the edges of cultivation where these offer small groves of suitable trees for its nest. It feeds mostly on winged insects but will also descend to the ground to capture its prey. Like the Black Drongo this is a very courageous bird and attacks all and every suspicious (avian) character.
NIDIFICATION : Similar to the foregoing species. The nests may be at any height from the ground from 10′ to 60′. Four is the normal clutch but it is not uncommon to find three as the full complement. May and June are the principal laying months. The eggs are slightly smaller than those of the Black Drongo and more heavily marked.

125. **Chibia hottentotta hottentotta** (Linn.). The Indian Hair-crested Drongo.

LENGTH : 12 inches.
FIELD CHARACTERS : Entire plumage black with green reflections; comparatively long curved beak; the tips of the two outer tail-feathers curled upwards. Sexes alike.
DISTRIBUTION : Found in the lower hills up to 3500 ft.
GENERAL HABITS : To a great extent its distribution seems to be governed by the presence of the silk cotton tree (*Bombax*). This is a true forest species

usually seen singly but frequently two or three may be observed feeding in the same cotton tree, where the nectar and insects are an irresistible attraction. Some of its notes are quite melodious.

NIDIFICATION: This does not differ to any great extent from the other drongos except that the nest and eggs are a trifle larger. The breeding season is April-June.

126. **Acrocephalus dumetorum** Blyth. Blyth's Reed-Warbler.

LENGTH: 5 inches.

FIELD CHARACTERS: Upper plumage olive brown; there is a pale buff streak over the eye. Lower plumage pale buff.

DISTRIBUTION: This is a Spring and Autumn passage migrant passing leisurely through these hills from the end of April to the first ten days in June. On the return passage in September it hurries through to the Plains.

GENERAL HABITS: Bush-clad hillsides, hedgerows and gardens form its favourite haunts while it visits these Hills. It is of a skulking nature not venturing into the open more than it can help. Its song consists of a jumble of harsh notes uttered as it works through the cover.

127. **Locustella nœvia straminea** Seebohm. The Eastern Grasshopper-Warbler.

LENGTH: 5½ inches.

FIELD CHARACTERS: Upper plumage olive brown; each feather centred dark brown; a narrow white supercilium. Below pale buff, chin and throat white; under tail coverts broadly centred with black.

DISTRIBUTION: Spring and Autumn passage migrant, May being the month of upward movement and August of return.

GENERAL HABITS: So secretive a bird that very few observers would suspect its presence. Its movements on the ground would lead one to believe it was a mouse. It has a reeling song when on its breeding ground but is silent while on migration.

128. **Orthotomus sutorius guzerata** (Latham). The Indian Tailor-Bird.

LENGTH: 5 inches.

FIELD CHARACTERS: Crown of head rufous; remainder of upper parts yellowish green; lower plumage sullied white.

DISTRIBUTION: Resident in the lower hills generally not ascending above 4,500 ft., rarely to 6,500 ft.

GENERAL HABITS: Keeps low down in the harbage and evergreen undergrowth where it is more often heard than seen. Its whereabouts are revealed by its comparatively loud call *pitch-er, pitch-er, pitch-er.*

NIDIFICATION: May to July are the months in which most nests will be found. The true nest is made of grass-stems and fibres, lined with some soft substance and a few hairs. This is placed between two or three leaves which have been sewn together by the birds with white vegetable down. Three to five eggs normally constitute the clutch. In colour these are of two types; one pale blue, the other white in ground colour, marked with blotches of red-brown.

129. **Cisticola juncidis cursitans** (Frankl.) The Streaked Fantail-Warbler.

LENGTH: 4 inches.

FIELD CHARACTERS: Upper plumage very dark brown each feather broadly edged fulvous; rump plain rufous; eye streak and lower plumage pale buff; most of the tail feathers with broad white tips. Sexes alike.

DISTRIBUTION: Found at the foot of the hills, i.e. the Grass Farm at Kalka, 2,500 ft. Outside our area practically the whole of India.

GENERAL HABITS: Resident though it may have to shift its ground due to grazing or grass cutting for it must have ample cover. Its flight is low and unsustained. Silent for the most part except in the breeding season when the male may be seen performing his jerky nuptial flights which are accompanied by a clicking note.

NIDIFICATION: July to September are the principal months in which nests may be found. These are placed a few inches from the ground in tufts of growing grass. Their structure is peculiar, i.e. the grass blades are drawn together and fastened with white vegetable down with the opening at the top reminding one of a huge chrysalis from which the moth has emerged; the inside is lined with vegetable down. The usual clutch is 4 or 5; these are pale blue or white with blotches and freckles of pale red-brown and lilac.

130. **Franklinia gracilis hodgsoni** (Blyth). Franklin's Wren-Warbler.

Length: 4 inches.

Field Characters: In summer the whole upper plumage is dark ashy grey; the wings and tail washed with rufescent brown. Under parts white with an ashy band across the breast. In the winter plumage the upper parts are brown; wings and tail coverts rufous; supercilium white; under parts white. The tail at this season is ½ inch longer. Sexes alike.

Distribution: From the foot of the hills to 5,000 ft. A slight downward movement takes place in the cold weather. Outside our area widely spread, in several races over most of India.

General Habits: Gregarious for most of the year when parties of 12 to 20 may be met with working their way through the bushes and undergrowth in their search for insects. They keep up an incessant call-note *pree-dee-dee* as they move along.

Nidification: This takes place from June to September. The nest and method of enclosing it within 2 or more leaves resemble closely those of the Tailor-Bird. Three or four eggs are laid which are either pure white or pale blue speckled with reddish-brown.

130a. **Sylvia althœa** Hume. Hume's Lesser Whitethroat.

Length: 6 inches.

Field Characters: Upper plumage greyish brown, slightly darker on the crown; tail dark brown tipped with white, the outermost feathers almost entirely white; lores, round the eyes and ear-coverts dark brown; the whole lower plumage pale cineraceous. Sexes alike.

Distribution: Mr. H. W. Waite obtained two specimens in the Sutlej Valley in May, one at Urni, the other at Kanam. In winter it migrates to S.W. India and Ceylon.

General Habits: The same as the next species.

Nidification: It is known to breed in Kashmir, otherwise the nesting habits re similar to those of the Indian Lesser Whitethroat.

131. **Sylvia curruca blythi** Ticeh. & Whist. The Lesser Whitethroat.

Length: 5½ inches.

Field Characters: Upper plumage earth-brown; crown of head greyer; outer tail feathers broadly edged white; the whole of the undersides sullied white. Sexes alike.

Distribution: A winter visitor, common in the plains of Northern India. In our area I have observed it rarely at Kalka, 2,500 ft. Whistler found it scarce in the Kangra District.

General Habits: A quiet unobstrusive bird which moves through the bushes and tree tops in its hunt for insects uttering, from time to time, a loud *tchak*. Just before its departure in spring for its northern breeding grounds it occasionally utters a pretty little jumble of a song.

132. **Phylloscopus affinis** (Tickell). Tickell's Willow-Warbler.

Length: 4½ inches.

Field Characters: Upper plumage olive-brown; a broad yellow supercilium; lower plumage deep dull yellow. Sexes alike.

Distribution: A Spring and Autumn passage migrant passing through on the upward migration in May and returning in October on its way to its winter quarters.

General Habits: As with all the Willow-Warblers this is an active sprightly little bird, always hunting for the small insects which constitute its food. It feeds mostly at some little height from the ground. The male has a curious little medley of a song.

133. **Phylloscopus tytleri** Brooks. Tytler's Willow-Warbler.

LENGTH : 5 inches.

FIELD CHARACTERS : Upper plumage olive brown ; wings and tail brown edged with brighter olive ; a buff supercilium ; lores and behind the eye dark brown ; lower plumage sullied buff. Sexes alike.

DISTRIBUTION : Another passage migrant passing through Simla in April and early May, returning in October.

GENERAL HABITS : This species haunts the lower bushes 2 or 3 feet above ground level. The usual call-note is a thin squeak. The song consists of 4 or 5 notes. Whistler (Birds of Kangra District 'Ibis' 1926 p. 543) found it difficult to distinguish from *Ph. nitidus* but the respective songs and habits are quite different.

NIDIFICATION : Breeds from Kashmir to Kumaon at elevations from 8,000 ft. to 12,000 ft. from the end of May to July. The nest is domed and placed from 10 ft. to 20 ft. or more from the ground. It makes a neat nest of grass mixed with feathers, birch bark and hair with a quantity of lichen ; lined with feathers. The eggs are unmarked white and usually 4 in the clutch.

134. **Phylloscopus collybita tristis** Blyth. The Brown Willow-Warbler or Chiff-Chaff.

LENGTH : 5 inches.

FIELD CHARACTERS : Upper plumage brown (faintly tinged with green in fresh plumage) with a pale buff supercilium. Wings and tail dark brown, finely edged with olive-yellow. Lower plumage buff ; wing lining primrose-yellow. Sexes alike.

DISTRIBUTION : This is a winter visitor to the Simla Hills arriving in October and leaving us again in early April.

GENERAL HABITS : This is the only migratory Willow-Warbler that remains in the hills during the cold season ; at this time of the year it frequents bush-clad open hillsides (*Berberis* sp.) flitting from bush to bush in its hunt for insects, and uttering from time to time a thin low squeaking note. Its well known cheery *chiff-chaff* song is freely uttered in the Spring when it often mounts to the tops of trees. During a bad spell of severe weather it descends to the lowest valleys but in fine weather is found up to 6,500 ft. or 7,000 ft.

135. **Phylloscopus griseolus** Blyth. The Olivaceous Willow-Warbler.

LENGTH : 5 to 5¼ inches.

FIELD CHARACTERS : Upper plumage earth brown ; wings and tail brown with paler edges ; supercilium bright yellow. Lower plumage buffy-yellow, dusky yellow on the breast and flanks. Axillaries and under-wing coverts brown. Sexes alike.

DISTRIBUTION : Spring passage migrant passing in a westerly direction along the foot of the hills in April. It is then common at 4,000 feet. Not observed on its downward passage.

GENERAL HABITS : A bird of the low herbage, even clambering over stones and boulders like a small babbler. Its call-note is a characteristic *pluck*.

136. **Phylloscopus maculipennis** (Blyth). The Grey-faced Willow-Warbler.

LENGTH : 4 inches.

FIELD CHARACTERS : A broad coronal streak and supercilium very pale whitish buff ; rest of head, nape and hind neck olive-brown, shading into yellowish green of the back. Rump bright sulphur yellow ; 2 wing-bars, the upper one rather indistinct ; tail with inner webs of outer feathers largely white ; chin, throat and breast grey. Remainder of lower plumage dusky yellow. Sexes alike.

DISTRIBUTION : A winter visitor arriving in November and leaving again in March and April.

GENERAL HABITS : During its stay in these hills it is mostly addicted to haunting the medium sized evergreen trees, Holly, rhododendron and the two oaks (*Q. incana* and *dilutata*). Usually inhabits the zone 5,000 feet to 7,500 feet. Whistler only observed it in the Kangra Valley from December to March. Its note is a sort *zitt*.

137. **Phylloscopus pulcher kangrae** Ticehurst. The Orange-barred Willow-Warbler.

LENGTH: 4½ inches.

FIELD CHARACTERS: A faint coronal streak yellowish; supercilium greenish buff; crown and nape olive green; rump yellow; two well marked wing-bars orange; tail brown the edges of the feathers olive-yellow, 3 outer ones mostly white; lower plumage greenish yellow. Sexes alike.

DISTRIBUTION: This is another winter visitor to the Simla area. Said to occur from Afghanistan to Garhwal. Its winter habitat is mostly from 4,000 ft. to 7,000 ft. November to March when it disappears entirely from these parts for its breeding quarters at higher elevations. Waite did not meet it along the Hindustan-Tibet Road.

GENERAL HABITS: Similar to the last species.

NIDIFICATION: Takes place in June and July. The nest is composed of green moss, grass, lichen and strips of birch-bark and warmly lined with feathers. It is domed with the entrance at the side and placed at varying heights, 8 ft. to 15 ft. from the ground. The clutch is usually four eggs, white with reddish-brown blotches and specks mostly at the large end and sometimes forming a zone here.

138. **Phylloscopus proregulus simlaensis** Ticehurst. Ticehurst's Willow-Warbler.

LENGTH: 3½ inches.

FIELD CHARACTERS: Broad coronal band and supercilia to the nape yellow; head dark olive brown, lighter on the back; rump bright yellow; two yellow wing bars; tail brown edged with olive-yellow; under parts pale buff suffused with yellow on the abdomen. Sexes alike. This is our smallest Willow-Warbler, differing from *P. maculipennis* by the absence of white in the tail.

DISTRIBUTION: Resident, only descending to lower elevations in the coldest weather. Found from 4000′ to 10,500′ and probably up to tree limit.

GENERAL HABITS: Usually solitary but in winter often found attached to the mixed foraging parties composed of the various species of Tits, Tree-Creepers and other small birds. Its favourite haunts are the deodar (*Cedrus deodara*) forests.

NIDIFICATION: The breeding season is May and June. The nest is a neat little ball of moss, lichen, a few strands of grass and lined with feathers. A number of nests found were all placed in deodars, at heights of 6′ to 35′ from ground. One was against the main stem but most were some distance from the trunk, usually at the bifurcation of two branches. Eggs four, white with numerous blotches and dots, mostly at the large end.

139. **Phylloscopus subviridis** (Brooks). Brooks's Willow-Warbler.

LENGTH: 3½ inches.

FIELD CHARACTERS: Whole upper plumage clear greenish yellow; faint coronal streak and supercilium yellow; two wing-bars yellowish white; tail brown each feather edged greenish yellow; lower plumage pale dusky yellow. Sexes alike.

DISTRIBUTION: In winter I found it fairly common in the Kala Chitta hills below Attock. Rare passage migrant through the Simla area.

GENERAL HABITS: In the plains its favourite haunts are the 'Kikar' and other thorny trees. The call-note is very similar to those of the three foregoing species.

NIDIFICATION: Major C. H. T. Whitehead found it breeding at elevations between 7,000 ft. and 9,000 ft. in the Kurram Valley in June and July. The nest was placed on the ground on a sloping bank; made of grass, lined with goats' hair and domed. The eggs are white with red spots and speckles.

140. **Phylloscopus inornatus humii** (Brooks). Hume's Willow-Warbler.

LENGTH: 4 inches.

FIELD CHARACTERS: An obsolescent coronal streak; upper plumage dull olive green; a broad buffy white eye-streak; two wing-bars, the upper one rather obscure; tail brown each feather edged with olive green; under parts sullied white. Sexes alike.

DISTRIBUTION: Spring and Autumn passage migrant and common at these seasons from the foot-hills to 9000 ft.

General Habits: Like all the other Willow-Warblers a restless bird frequenting alike forest and trees bordering cultivation, incessantly uttering its call-note *tis-ip*.

Nidification: Breeds commonly in Kashmir where its nest may be found in May and June. The situation is on a sloping bank; shape globular with the entrance at the side; materials, coarse grass, lined with finer grass and hair and fur. Four eggs are the normal clutch. They are white marked with red brown specks and spots.

141. **Phylloscopus trochiloides viridanus** (Blyth). The Greenish Willow-Warbler.

Length: 5 inches.

Field Characters: Upper plumage light olive-green, brighter on the rump; supercilium bright yellow; lores and a line behind the eye dark yellow; wings with a single buff bar; tail brown each feather edged greenish; lower parts dusky yellow, greyer on flanks. Sexes alike.

Distribution: Passage migrant April and May. Outside our area practically the whole of India during the cold season. On the Autumn migration it is common from the end of August and throughout September.

General Habits: In some years this bird passes through Simla in great numbers with the next subspecies during April and early May. At this season they keep to the upper branches of the oak trees (*Q. incana*) and keep up a continuous warbling.

Nidification: Very few authentic records of its breeding in Indian territory can be relied on; perhaps a few breed high up in the Kashmir highlands and Baltistan. Waite found a nest of the race *Phyll. trochiloides ludlowi* above Nachar in the Sutlej Valley at c.a. 10000′ on June 8 containing four eggs and obtained the female which Whistler identified as above.

142. **Phylloscopus (trochiloides ?) nitidus** Blyth. The Green Willow-Warbler.

Length: 5 inches.

Field Characters: Resembles *viridanus* but the colours are brighter, specially the under parts which are bright yellow. Wing bar bright yellow, and in freshly moulted specimens a second bar is also indicated.

Distribution: Not uncommon on the upward migration which takes place in April and May but seems to follow quite a different route on its downward passage.

General Habits: Differs in no way from those of *viridanus*.

N.B.—Dr. C. B. Ticehurst in his masterly work 'A Systematic Review of the Genus Phylloscopus' was somewhat of the opinion that *nitidus* was a species apart from the *trochiloides* group due to the lack of any intergrades.

143. **Phylloscopus magnirostris** Blyth. The Large-billed Willow-Warbler.

Length: 5½ inches.

Field Characters: Upper parts, edges to the wings and tail dark yellowish olive; a conspicuous supercilium yellowish white with a dark olive line below it; wings and tail brown with a faint white edge to the inner web of the outer tail-feather. A single wing-bar yellowish white; there is a faint indication of a second wing-bar on the median coverts. Underparts dusky yellowish white.

Distribution: In Simla and the immediate neighbourhood only occurs as a passage migrant in May and September. Very few records for these hills.

General Habits: A forest bird. The few I have encountered in Spring were haunting the upper branches of tall trees. The Autumn bird was in my garden. The song is of four notes *tsee-seesee-tseee* and is diagnostic.

144. **Phylloscopus occipitalis occipitalis** (Blyth). The Large Crowned Willow-Warbler.

Length: 5¼ inches.

Field Characters: A very distinct median coronal streak and two broad lateral coronal streaks dusky olive; Supercilium primrose yellow. Upper parts, edges of wing feathers and tail light yellowish-olive; double wing-bars yellowish white; three outer tail-feathers narrowly edged white on the inner webs. Under parts dull white tinged with pale grey on breast and flanks.

DISTRIBUTION: A very common breeding visitor to the Simla Hills arriving early in March and leaving again about the first week in July descending into the lower hills for a month or more before final departure to their winter quarters in S. India.

GENERAL HABITS: Arboreal. Breeds between 6,000 ft. and 9,000 ft. A very restless bird continually flapping its wings and flirting the tail. It is the noisiest Willow-Warbler, the song being a rapidly repeated *chi-zit*.

NIDIFICATION: Takes place in May and June. The nest is made of moss and lined with the fur of mammals (monkeys, squirrels, and deer). It is almost invariably placed well out of sight in a hole of some sort, a hole in a revetment wall being the most favoured site in these parts. Other sites are among the roots of a tree or a hole in a tree. The eggs are immaculate white and usually number four.

145. **Phylloscopus reguloides kashmiriensis** Ticehurst. Blyth's Crowned Willow-Warbler.

LENGTH: 5 inches.

FIELD CHARACTERS: A small edition of *Phyll*: *occipitalis*.

DISTRIBUTION: From Kashmir to Garhwal in summer. Probably winters in the foothills as I found it common at Berrik in the Tista Valley (1,200 ft.) during the cold weather of 1944.

GENERAL HABITS: An uncommon species. Arboreal and met with singly; like all the Willow-Warblers a restless little bird constantly flirting its wings as it moves about.

NIDIFICATION: May, June and July are recorded as being the breeding season. I never came across it during the breeding time but Whistler recorded it as being common during summer at 9,500′ to 10,500′ in the Kharsu Oak Zone. The nest and eggs don't differ from those of the preceding species except that they are a trifle smaller.

146. **Seicercus burkii whistleri** Ticehurst. Dharmsala Black-browed Flycatcher-Warbler.

LENGTH: 4½ inches.

FIELD CHARACTERS: A distinct green coronal streak; 2 broad blackish-brown lateral coronal stripes bordered distinctly with grey; a conspicuous yellow ring round the eye; upper parts, margins of wing and tail feathers olive green; outer two pairs of tail-feathers mostly white; under parts bright yellow. Sexes alike.

DISTRIBUTION: A resident between 2,500′ to 10,000′. Single birds are usually seen about Simla both on the upward and downward movements.

GENERAL HABITS: A forest bird keeping much to the under storey uttering its subdued little call-note *pillip*, a faint edition of that of the Cinnamon Tree-Sparrow. It is not common but a few may be heard and seen each season.

NIDIFICATION: Breeds in June and July, making the usual domed nest of green moss placed on the ground. The eggs are white without markings.

147. **Seicercus xanthoschistos xanthoschistos** (Gray). The Kashmir Grey-headed Flycatcher-Warbler.

LENGTH: 4½ inches.

FIELD CHARACTERS: Forehead, crown and nape ashy grey, the centre of the crown paler; sides of head ashy brown; back, visible parts of wings and tail yellowish olive; the inner webs of the two outer tail-feathers white; a white supercilium; lower parts bright primrose yellow. Sexes alike.

DISTRIBUTION: Very common. Resident between 2,500′ to 9,000′, with some downward movement in the cold weather.

GENERAL HABITS: A forest bird keeping mostly to the lower storey. Found alike in pine, oak and deodar forest, sometimes in the denser growth but usually in the more open parts. Tame and fearless.

NIDIFICATION: Breeds from March to June. The nest is the usual domed structure made of green moss and grass lined with hair and fur. It is placed on the ground often protected by an overhanging bush. The eggs number four or five and are immaculate white. This species is often victimised by the Himalayan Cuckoo (*C. optatus*).

148. **Homochlamys pallidus** (Brooks). The Pale Bush-Warbler.

LENGTH : 5 inches.

FIELD CHARACTERS : Dark earth brown above, the edges of wing and tail feathers tinged rufous; supercilium pale buff; lower plumage sullied white, almost fulvous grey. Sexes alike.

DISTRIBUTION : In summer found up to 10,000 ft. descending in winter to the foothills and rarely some miles out into the Plains.

GENERAL HABITS : It is an arrant skulker and rarely shows itself to the observer, keeping to dense cover in forest glades where the wonderful song of the male proclaims its presence. Apart from the breeding season it is a solitary bird uttering a single note *tchuk*.

NIDIFICATION : Breeds in June and July from 7,500 ft. to 10,000 ft. The nest is usually placed in a bush of Honeysuckle sp. or Syringa sp. within 6 feet of the ground; it is made of the broader leaved grasses and lined copiously with feather; sometimes it is domed or it may be a very deep cup-shaped structure. The eggs normally number four and are a deep chocolate.

149. **Horeites brunnifrons whistleri** Ticehurst. The Simla Rufous-capped Bush-Warbler.

LENGTH : 4 inches.

FIELD CHARACTERS : Forehead, crown and nape chestnut; upper plumage including edges of wing and tail-feathers rufous brown; supercilium pale buff; ear-coverts ashy brown, chin, throat and breast grey; flanks fulvous brown; abdomen white. Sexes alike.

DISTRIBUTION : Resident from 4,000′ to 19,500′ the lower elevation being its winter habitat. It passes through these hills in April and October.

GENERAL HABITS : A bird of the open bush-clad hillsides and an arrant skulker. Its song is very similar to that of the Greyheaded Flycatcher-Warbler.

NIDIFICATION : Hugh Whistler found it fairly common at 10,500′ to 11,500′ on the Duala Dhar range above Dharmsala in June and recorded that it was clearly breeding though he found no nest. B. B. Osmaston however found the typical form breeding near Darjeeling; he records the nest as being very similar to that of *Homochlamys*, but the eggs are terra cotta with a darker cap at the larger end. They number three to five.

150. **Suya criniger criniger** Hodgson. The Brown Hill-Warbler.

LENGTH : 7 inches.

FIELD CHARACTERS : Upper plumage dark brown; tail rufous brown obsoletely cross rayed; cheeks and ear-coverts dark brown; lower plumage fulvous-white. The female during the breeding season has a short buff supercilium and is 1½ inch less than the male's total length. In winter the sexes are alike, the plumage at this season being rufous brown each feather with a dark centre; below pale fulvous.

DISTRIBUTION : In summer it is found from 4,000′ to 7,500′ but occasionally up to 10,500′ (summit of Mt. Huttoo!) which no doubt is exceptional. In winter down to the foothills 2400′.

GENERAL HABITS : A denizen of the grassy hillsides. The usual call-note is a *tchak-tchak*. The song of the male a repetition of *chik-ra-chu* uttered ad nauseum from some elevated point of vantage, or as it dive-bombs at the female or in the vicinity of the nest.

NIDIFICATION : The breeding season is from June to August. The nest is almost always placed in grass within a foot or 18 inches of the ground; the materials used are mostly vegetable down strengthened with a few strands of green grass firmly attached to the supporting stems. In shape it is oval with the entrance near the top. The eggs are white or cream with a zone of bright red closely set blotches; they normally number four. If they should number more it would be advisable to examine them very carefully as Mr. W. H. Matthews finds that the Plaintive Cuckoo victimises this species and it takes a keen eye to differentiate the eggs.

151. **Prinia sylvatica gangetica** (Blyth). The Jungle Wren-Warbler.

LENGTH : 7½ inches.

FIELD CHARACTERS : Above dull earthy brown tinged rufous on the rump; tail brown all but the central pair tipped white with a black subterminal patch, the outermost pair almost wholly white on the inner web; all the feathers faintly cross-rayed; a short supercilium buff; lower plumage buff. Winter plumage warm rufous brown, the lower parts ochraceous. No white in the lateral tail feathers. Sexes alike.

DISTRIBUTION : Resident between 2,000 ft. to 3,500 ft. from Kangra to Assam. Common at Kalka just outside the forest.

GENERAL HABITS : Frequents the low prickly bushes choked with coarse grass which so often clothe the margins of the small ravines in the foothills. It has a loud shrill song during the monsoon at which time it breeds, and indulges in the dive-bombing display and beak-snapping much like the Brown Hill-Warbler.

NIDIFICATION : From June to September. The nest is domed or a deep cup. The materials employed are much the same as those used by the last species. The situations are mostly a small dense bush or a clump of coarse grass. The eggs are white, pinkish or pale-blue green marked with fine specks of red-brown. The usual clutch is four.

152. **Regulus regulus himalayensis** (Jerdon). The Himalayan Goldcrest.

LENGTH : 3½ inches.

FIELD CHARACTERS : Adult male, centre of crown flame coloured edged with bright yellow, sides of crown black, upper parts olive-green, brighter on rump; tail feathers brown edged with olive yellow; a black patch on the centre of the wing and two wing-bars; below pale dusky white tinged with olive green. Adult female lacks the flame coloured crown of the male, but is otherwise similar.

DISTRIBUTION : A common winter visitor to the coniferous forests about Simla between 6,000 ft. and 8,000 ft.

GENERAL HABITS : Arrives here towards the end of October remaining with us till the end of March when it leaves for the higher elevations. A very hardy little mite. I have watched a small party of them bathing in a handful of melting snow, about a dozen taking their turn one by one while I was standing five or six feet away. The note is a high-pitched mouselike *tse-tse-tse.*

NIDIFICATION : May, June and July are said to be the breeding season in the Kashmir hills; the nest is a beautiful little hammock slung from the underside of a bifurcation of a horizontal branch of a coniferous tree at from 12′ to 40′ or more. It is made of green moss, lichen and spiders' web and cocoons. The eggs are pinky buff with a zone of the same, but a shade darker, at the larger end.

153. **Cephalopyrus flammiceps feammiceps** (Burton). The Fire-capped Tit-Warbler.

LENGTH : 4 inches.

FIELD CHARACTERS : Male : forehead and crown flaming scarlet; upper parts bright olive yellow; wings and tail brown, each feather edged olive yellow; lores and supercilium washed with scarlet; chin and upper throat scarlet orange, lower parts golden yellow. Female : a dull edition of the male. A dumpy little bird with a comparatively short tail.

DISTRIBUTION : Occurs from Kalka (2,500 ft.) to 8,500 ft., the upper limit of its breeding range. In winter it wanders out into the plains as far as the Central Provinces.

GENERAL HABITS : This bird is very tit-like in its feeding habits clinging to the extremity of the small twigs to examine the fresh foliage for insects which its strong feet and tarsi enable it to do. It has absolutely no affinities with any warbler that I know of. It is a forest bird, found in small scattered parties during the winter months. Arrives in the hills in March, departing in October. The song of the male is a subdued edition of that of the Goldfinch.

NIDIFICATION : April and May are the only months in which I have found the nest which is always placed in a small hole in a tree from a foot to 20 feet above ground level. The material used is fine long strips of dry grass which the female alone brings though the male is always in close attendance.

The female is a close sitter and hisses at the intruder after the manner of the tits. The eggs usually number four and are unmarked blue green in colour.

154. **Oriolus oriolus kundoo** (Sykes). The Indian Oriole.

LENGTH: 9½ inches.

FIELD CHARACTERS: Male: the whole head and body rich yellow; lores and space round the eye black; middle tail feathers black with narrow yellow tips, the others progressively less black till the outermost pair are almost entirely yellow; wings black, all the quills tipped and partially margined with yellow. The female differs from the male in having the back and scapulars tinged with green.

DISTRIBUTION: A common summer visitor to these hills from 2,500 feet to 5,000 ft. or more. Arriving early in April and leaving for the plains in September. Found throughout India; not E. Bengal.

GENERAL HABITS: Partial to the small groves of trees in the vicinity of cultivation. Does not enter heavy forest. The food consists of fruit and insects. The call-note is flute-like but it has no real song.

NIDIFICATION: Most eggs are laid in May and June. The nests are slung 10′ to 40′ from the ground from a bifurcation of a branch to which they are strongly attached by stout strands of grasses and fine strips of bark. From below it looks like a yellow ball of grass. The eggs, which number two to four, are china white sparsely blotched with black or dark brown.

155. **Sturnus vulgaris poltaratzskii** (Finsch). The Starling.

LENGTH: 8½ inches.

FIELD CHARACTERS: The whole plumage is metallic black, the irridescence comprises green, purple, blue and red; each feather tipped with buff. At a distance it appears all black or dark grey. Sexes alike.

DISTRIBUTION: Occurs rarely at the foot of the hills, i.e. around Kalka. The hosts of Starlings seen in India are winter visitors arriving in the North West in October and leaving us again in March. But there are two resident races, one in Sind, the other breeding in Kashmir.

GENERAL HABITS: Highly gregarious feeding mostly on the ground where it does untold good in destroying noxious insects.

156. **Sturnia malabarica malabarica** (Gmelin). The Grey-headed Myna.

LENGTH: 8 inches.

FIELD CHARACTERS: The whole upper plumage dark grey, the feathers on the head and neck long and pointed; wings blackish; the feathers edged with silvery grey; lower plumage rufous paler on the chin and throat and deeper on the abdomen and flanks. Sexes more or less alike.

DISTRIBUTION: Widely distributed in the plains where I have seen it once at Nabha and once at Jagadhri, both localities in the Punjab where it is rare. But it is to my son Paul that the credit goes for finding it breeding in these Hills; this was at a village near Suni, 2,500 ft., Bhajji State, on June 6th, 1944.

GENERAL HABITS: The Grey-headed Mynah is much more arboreal than are most of the mynahs. Its main diet consists of fruit and nectar from flowering trees, it also feeds on insects and occasionally descends to the ground. After the breeding season the birds collect into small flocks. When feeding a continual chatter is kept up, the song is a pleasant warble.

NIDIFICATION: Takes place in April, May and June. The nest is in a hole in a tree, either a natural one or a disused woodpecker's or barbet's from ten to fifty feet from the ground. In the nest my son took there were four partially incubated eggs and he found a second one in which there were three young ones. In colour the eggs are a pale sea-green without markings. The material lining the holes was green leaves only.

157. **Temenuchus pagodarum** (Gmelin). The Brahminy Mynah.

LENGTH: 8 inches.

FIELD CHARACTERS: From forehead to nape a black crest; upper plumage pale grey; sides of the head and underparts rich buff; primaries and primary coverts black; tail brown broadly tipped white. Sexes alike.

DISTRIBUTION : Almost the whole of India ; it avoids the humid country to the East and the arid country on the West. In these hills it is a summer visitor up to 5,500 ft. where it is not uncommon about the cultivated areas.

GENERAL HABITS : A terrestrial species more addicted to feeding on the ground than the Grey-headed Mynah, otherwise their habits are much the same, though it prefers more open country.

NIDIFICATION : Takes place in May and June. The nesting sites, material for the nests and colour of the eggs are all much the same as those of the last species.

158. **Acridotheres tristis tristis** (Linnaeus). The Common Mynah.

LENGTH : 9½ inches.

FIELD CHARACTERS : Head, neck and breast black ; remainder of body plumage rich vinous brown paler on the abdomen where it tends to be white ; a large white patch on the flight feathers. Tail broadly tipped white. Sexes alike.

DISTRIBUTION : The whole of India ascending the Hills to 8,000 ft.

GENERAL HABITS : Familiar and confiding, practically parasitic on man. At the approach of the breeding season great battles take place to decide which pair is to retain possession of a certain nesting site. At these times the females are just as aggressive as the males. Not much harm seems to be done as grasping each other's feet the opponents lie on their backs and shout at the tops of their voices.

NIDIFICATION : May to August is the normal duration of breeding activities, which rather looks as if the birds were double-brooded. Any hole in a house, a tree, in a wall and not uncommonly down a well will do. The nest is made of straw, feathers, green leaves and scraps of paper. The eggs number four or five and are unmarked pale bluish-green.

159. **Æthiopsar fuscus fuscus** (Wagler). The Jungle Mynah.

LENGTH : 9 inches.

FIELD CHARACTERS : To the casual eye very similar to the Common Mynah but the pale eye and the tuft on forehead are diagnostic, besides which its ashy brown upper and lower parts also differ from its larger cousin. Sexes alike.

DISTRIBUTION : Almost the whole of India in the more forested hilly tracts. It ascends the Himalayas to 5,000 ft. or more. In the Simla Hills there are colonies at the Ashni River bridge and one between Salogra and Solan.

GENERAL HABITS : It appears to be gregarious for the whole year. The colonies cited above consist of a dozen or more pairs in each. In the cold season it descends to the plains returning to its breeding quarters in April. Its food is more insectivorous than is the case of *A. tristis* ; it is also fond of fruit of all kinds.

NIDIFICATION : Nesting operations take place in May and June. The nests at the Ashni River colony are in the weep-holes of the masonry supporting the bridge, those at Salogra are in natural holes in igneous rocks. The holes are lined with straw, grass, feathers and green leaves. The clutch consists of 4 or 5 eggs as a rule and in colour resemble those of the Common Mynah.

160. **Saroglossa spiloptera spiloptera** (Vigors). The Spotted-winged Stare.

LENGTH : 7½ inches.

FIELD CHARACTERS : Male : upper plumage grey, each feather margined narrowly with black ; rump plain brown ; upper tail coverts rufous-brown ; tail brown tinged rufous ; lores, cheeks and earcoverts black ; chin and throat deep chestnut ; the whole lower plumage rufous, paler on the abdomen ; primaries, secondaries and primary coverts black edged with metallic green and all the primaries with a white patch at their bases. Female : upper plumage sooty brown ; sides of the head dark brown ; lower plumage pale ashy-brown with broad white margins, the whole suffused with fulvous.

DISTRIBUTION : From the Kangra Valley to Assam visiting the submontane districts in winter ; Manipur and Pegu. It is a summer visitor to the Simla Hills up to 3,500 feet arriving in April when it is gregarious.

GENERAL HABITS : Closely resemble those of the Grey-headed Mynah. Soon after its arrival in these hills the flocks divide up into pairs and distribute themselves over the country. Open forest is their favourite habitat. They feed much on the nectar of flowers of the different forest trees and small figs and berries, besides indulging in short sallies after flying insects. The note is a twittering warble.

NIDIFICATION: Takes place in May in which month I took a nest near Salogra on 24-5-20. This was in a barbet's old nest-hole 20 feet from the ground. There were 4 slightly incubated eggs resting on a lining of green leaves. Colour pale bluish green blotched sparingly over the surface with reddish-brown.

161. **Ploceus philippinus philippinus** (Linnaeus). The Baya Weaver-Bird.

LENGTH: 5½ inches.

FIELD CHARACTERS: Male in breeding plumage: a mask, including sides of head, chin and throat cinerous black; crown of head and breast bright golden-yellow; upper plumage dark brown, each feather edged buff or yellow; wings and tail dark brown, edged buffish-yellow; lower parts fulvous. Male and female in winter plumage: the whole upper plumage is fulvous streaked with blackish brown, which are obsolescent on the rump; wing and tall the same as the male in breeding plumage; a buff supercilium; underparts buff.

DISTRIBUTION: Almost the whole of India and ascending the Himalayas to 4,000 ft. from Kangra eastwards. In the Simla Hills I have observed it at 3,500 ft. in Kunihar State where I found a scattered colony in August.

GENERAL HABITS: Highly gregarious for the whole twelve months. Its habitat is open country dotted about with palms of different kinds and babool trees (*Acacia arabica*). The diet is mostly grain and the seeds of various grasses. Insects also are occasionally eaten.

NIDIFICATION: The principal breeding season is from July to October. The wonderful retort-shaped nest is built jointly by the male and female. The materials used are fine strips of various grasses which the birds fashion into this unique structure. Mr. Sálim Ali, who has given us minute details of the economy of a nesting colony, tells us that the female lines the nest proper to her liking, while the male finishes off the tube entrance. Most nests are suspended over water. The eggs are from two to four in number and are unmarked white.

162. **Uroloncha punctulata lineoventer** (Hodgson). The Spotted Munia.

LENGTH: 4½ inches.

FIELD CHARACTERS: Upper plumage including wings chocolate; rump barred with brown and yellowish and streaked with white; upper tail-coverts glistening yellow; sides of head, chin and throat rich chestnut; lower plumage white, each feather edged with fulvous brown. Young birds of the year[1] are rufous-brown above and pale buff below without markings. Sexes alike.

DISTRIBUTION: Practically the whole of India with the exception of the more arid tracts to the west. Dalhousie is about its westerly limit and from there it extends eastwards to Assam from the foothills to 8,000 ft. which is exceptional, 5,000 ft. being about its upper limit. In the Simla Hills it is found from 2,500 ft. to 5,500 ft. and exceptionally to 8,000 ft. (Fagu).

GENERAL HABITS: Out of the breeding season it goes about in small family parties which break up on the approach of the breeding season and pair off. The rood is grass seeds, the flowering heads (when ripe) of the Indian corn and an occasional insect. It frequents open bush-clad hillside.

NIDIFICATION: Breeds during the monsoon. Capt. D. W. Cotton took a nest containing 6/7 fresh eggs on August 16th. The nest is large for the size of the bird. It is made of coarse and fine grass, domed, with an entrance at the side. The situation of the nest is in a *Berberis* bush and occasionally in a small tree at from 4 ft. to 15 ft. from the ground. The eggs are white without markings.

163. **Perissospiza icteroides** (Vigors). The Black-and-Yellow Grosbeak.

LENGTH: 9 inches.

FIELD CHARACTERS: Male: whole head, chin, throat, wings and tail black; remainder of plumage bright yellow. The thighs are black. Female: upper parts ashy-grey; breast ashy-brown; remainder of lower plumage and rump bright tawny fulvous.

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[1] and adults in non-breeding plumage.—S.A.

DISTRIBUTION: Not uncommon in the Simla Hills between 6,500 ft. and 10,000 ft. in the breeding season, descending to somewhat lower levels in winter. Also occurs to the west as far as the borders of Afghanistan.

GENERAL HABITS: This is a bird of the coniferous forests. Usually found in small loosely scattered parties; even in the breeding season the males are sociable. The food consists of berries and small fruits. I have even seen one eating a large slug on a public road. The usual note may be syllabilized *Twenty-two*, rapidly uttered.

NIDIFICATION: Breeds in May and June. The nests are placed from 12 ft. to 40 ft. from the ground, usually close to the main stem of a deodar (*C. deodara*) and are quite substantial structures composed of fine twigs as a foundation on which are placed grass moss, plant stems and lichen. The lining consists of fine grass and rootlets. The eggs number 2 or 3 and are pale sea-green marked mostly at the broad end with coarse dark brown twisted streaks.

164. **Perissospiza affinis** (Blyth). The Allied Grosbeak.

LENGTH: 9 inches.

FIELD CHARACTERS: Male: very similar to that of the last species. Differs from *P. icteroides* in having the thighs not black, but yellowish. Female: breast and rump olive yellow; back ashy-green.

DISTRIBUTION: Rare in the Simla Hills. My authority for including it in this list is Mr. J. D. Michael who saw some at Dharanghati 9,240 ft. It is found from Hazara to Sikkim at high elevations. Whistler found it above Dharmsala at 10,000 ft.

GENERAL HABITS: A. E. Osmaston found this species fairly plentiful at elevations from 6,000 ft. to 11,500 ft. in British Garhwal where they frequented mixed forest which contained a good percentage of coniferous trees. He tells us that they feed on unripe fruit and on one occasion he extracted two hairless caterpillars from the gizzard of one he had shot.

NIDIFICATION: Osmaston says from what he observed they start building operations at the end of May and beginning of June. I can find no further information regarding its breeding habits.

165. **Perissospiza carnipes carnipes** (Hodgson). The White-winged Grosbeak.

LENGTH: 9 inches.

FIELD CHARACTERS: Male: upper parts black with the exception of the rump which is greenish yellow; chin, throat and breast black; wings black, the primaries with white bases; abdomen, flanks and under tail-coverts greenish yellow. female similar to the male but the colours are more subdued.

DISTRIBUTION: A bird of high elevations found from Baluchistan to Sikkim. it occurs at Chini 9,000 ft. to 10,000 fit. whence I received a pair which Dr. van der Sleen kindly presented to me.

GENERAL HABITS: Nothing on record, but these probably do not differ from those of other Grosbeaks.

NIDIFICATION: Unknown.

166. **Mycerobas melanoxanthus** (Hodgson). The Spotted-winged Grosbeak.

LENGTH: 8½-9 inches.

FIELD CHARACTERS: Male: whole upper plumage slaty-black; white bases to some of the primaries; yellow oval spots towards the tips of the tertiaries; chin and throat slaty-black; lower plumage deep yellow. Female: upper plumage black, each feather edged pale yellow; a broad black streak through the eye; under parts yellow streaked with black.

DISTRIBUTION: From Hazara to Manipur, in summer at considerable elevations, in winter down to 4,000 ft. It occurs in some numbers during March, April and May in flocks, the 'Glen', below Viceregal Lodge, Simla, being a favourite locality.

GENERAL HABITS: A woodland species occurring in spring in flocks of from 6 to 40 or 50. They feed at this season on the kernels of the wild cherry which their powerful bills enable the birds to extract from the 'stone'. The call note is *krrrr.* On one occasion, in May, while I was watching a flock sitting in a pine tree (*P. longifolia*) I saw a pair in copula.

NIDIFICATION: Presumably breeds in June. Capt. Skinner took a nest containing 3 eggs which closely resembled those of the Black-and-Yellow Grosbeak except that the markings were much paler. This was at Dunga Gali and the nest was placed on the slender branch of a yew tree standing on a steep hillside.

167. **Pyrrhula aurantiaca** Gould. The Orange Bullfinch.

LENGTH: 5½ inches.

FIELD CHARACTERS: Male: a broad black band round the base of the bill; rump, under tail-coverts and under wing-coverts white; tail and wings black with steely-blue metallic reflections; wing-bar dusky, edged with orange-rufous; remainder of plumage deep orange. Female: a broad black band round the base of the bill as in the male; crown, neck and sides of head ashy brown, shading to yellowish brown on the back; rump white; throat and breast pale rufous; abdomen dull yellow.

DISTRIBUTION: From Hazara and Kashmir to Garhwal. Very rare winter visitor in our area, the only record being when my son Paul and David Cotton saw a pair on Jakko Hill (Simla) 7-4-1941, elevation 7,600 ft.

GENERAL HABITS: A woodland species feeding on fruits, berries and buds of trees such as cherry and willow. Small flocks and pairs. In flight the white rump of all the bullfinches is diagnostic.

NIDIFICATION: Breeds in Kashmir in August, usually placing its nest at no great height from the ground in a coniferous tree. The foundation of the nest is composed of fine twigs on which are placed fine roots. It is lined with moss roots and rhizomorphs. The eggs number 3 or 4, white in colour blotched with dark reddish-brown mostly at the large end.

168. **Pyrrhula erythrocephala** Vigors. The Red-headed Bullfinch.

LENGTH: 5½ inches.

FIELD CHARACTERS: Male: a broad black band at the base of the bill; crown, nape and hind neck vermillion; sides of the head, neck, throat, breast and abdomen paler red; back pure ashy-grey; rump white; tail and wings metallic black; wing-bar ashy grey; under tail coverts white. Female: resembles the male except that the head and nape are moss green; lower plumage earth brown.

DISTRIBUTION: Resident from 6,000 ft. to 9,000 ft. or slightly higher. Not uncommon in precincts of Simla during the cold weather but retiring to the inner Hills in May. Found from Chamba to Sikkim.

GENERAL HABITS: A woodland species keeping much to the secondary growth, feeding largely on the dried blackberry seed and leaf buds of Willow, Sallow and other shrubs. Usually seen in small parties. The call note is a soft *phew-phew.*

NIDIFICATION: Breeds during August in the Narkanda-Baghi area. The nest is much the same as that of the Orange Bullfinch. B.B. Osmaston is, I think, the only ornithologist who has taken the eggs of this species. They are white with dark red-brown blotches mostly in a zone round the large end.

169. **Pyrrhula nipalensis nipalensis** Hodgson. The Brown Bullfinch.

LENGTH: 6½ inches.

FIELD CHARACTERS: Male: A dark brown band round the base of the bill; crown and nape ashy brown, the feathers with dusky centres; back ashy brown; rump white; wings and tail black with purplish metallic reflections; wing bar pale ashy brown; the innermost tertiary margined exteriorly with crimson; underside plain ashy brown; under tail-coverts white. Female: Same as the male, with the exception that the inner margin of the innermost tertiary is yellow instead of crimson.

DISTRIBUTION: Occurs in the Narkanda-Baghi area, circa 8,500 ft. to 10,000 ft. during the summer; for the winter months there is no information. Found on the Daula Dhar, above Dharamsala, to Sikkim.

GENERAL HABITS: Arboreal. Has a more melodious call-note than the Red-headed Bullfinch. Otherwise it resembles that bird in habits and food.

NIDIFICATION: Nothing recorded.

170. **Loxia curvirostra himalayana** Blyth. The Himalayan Crossbill.

LENGTH: 5½ inches.

FIELD CHARACTERS: Male: upper parts from forehead red, brighter on the rump; feathers of the wings and tail dark brown with edges with narrow rufous margins; lower plumage red; under tail-coverts brown broadly edged with dusky white. Female: olive green (almost yellow on the rump) where the male is red.

DISTRIBUTION: From the Sutlej River and Lahoul to Sikkim. In October 1916 on two consecutive week-ends I observed several small parties on Kufri Hill (8,800 ft.); they were frequenting the tops of spruce and were very restless, so much so that I failed to secure a specimen.

GENERAL HABITS: A bird of the coniferous forests. The seeds of these, especially Spruce (*A. webbiana*), constitute its food, the bill being so formed as to enable it to extract the seeds with ease. Its movements when feeding are very parrot-like.

NIDIFICATION: Nothing on record for the Himalayan race but in Europe March and April are the breeding months. The nest is placed in a conifer fairly high up in the tree; it is constructed of fine twigs and lined with fine grass and rootlets. The eggs number 3 or 4 and are very pale bluish-white sparsely marked with dark red-brown blotches.

171. **Pyrrhospiza punicea humii** Sharpe. The Red-breasted Rosefinch.

LENGTH: 7½ inches.

FIELD CHARACTERS: Male: forehead and a short supercilium crimson, each feather tipped black; crown to lower back edged with light brown; rump rosy-red with dusky tips; cheeks, ear-coverts, chin, throat and breast crimson; abdomen ashy brown faintly streaked black; under tail-coverts brown, margined with pink. Female: whole upper plumage dark brown, margined paler; rump dull greenish; lower plumage fulvous with narrow black streaks.

DISTRIBUTION: From Kashmir to Sikkim into Tibet and China at high elevations from 9,000 ft. in winter to 17,000 ft. in summer.

GENERAL HABITS: Frequents the most desolate mountainous country where it feeds on the precipitous hillsides. Except for a fine male which Dr. van der Sleen obtained above Chini, and which he kindly presented to me, I know of no other record for these parts. The food consists mainly of seeds and other vegetation. Where found, the birds are not shy.

NIDIFICATION: July is the only month recorded when a female collected by Whistler in Lahoul was gathering goat's hair for its nest. Many years ago Stoliczka found the nest in Spiti and Ladakh; it was made of coarse grass and placed in a furze bush. 'The eggs were dirty white or greenish with some dark brown spots'.

172. **Carpodacus thura blythi** (Biddulph). The White-browed Rosefinch.

LENGTH: 6½ inches.

FIELD CHARACTERS: Male: lores and front of the face crimson; forehead, supercilium, cheeks, ear-coverts, chin and throat pale shining (silky) pink, with white shaft-streaks; the end of the supercilium white; crown, nape and back brown, broadly streaked with black; rump rosy pink; wings and tail dark brown, all the feathers margined with dull pink; lower plumage from throat uniform rosy pink. Female: upper plumage dark brown, streaked with black; rump and upper tail-coverts edged with golden yellow; forehead and a broad supercilium buff; chin, throat, breast and sides of body pale rufous, streaked with black.

DISTRIBUTION: A bird of high elevations occasionally coming in to Simla during the cold weather. It is found from Gilgit to Sikkim. Occurs from 7,500 ft. to 12,000 ft.

GENERAL HABITS: Gregarious in winter, though occasionally singletons are encountered, found both in forest and on the more open hillsides. The flocks I have personally encountered in these parts were composed of adult and immature males only. They feed on grass seeds and fly into a nearby tree when disturbed, though they are by no means shy.

NIDIFICATION: Mandelli found it breeding in Nepal in August. The nest was found in a thorny bush; it was composed of fine grass and moss and lined with white fur. The eggs number 3 and are dull greenish-blue with blotches of brownish-grey.

173. **Carpodacus pulcherrimus pulcherrimus** Hodgson. The Beautiful Rosefinch.

LENGTH: 6 inches.

FIELD CHARACTERS: Male: upper plumage ashy brown streaked with dark brown; rump rosy red; quills and tail black margined with ruddy brown;

a very broad supercilium, cheeks, ear-coverts, chin, throat and forehead pale rosy breast and abdomen rosy-red with black streaks; sides of body brown streaked darker. Female: upper plumage fulvous; brown, streaked black; wings and tail dark brown edged with fulvous; an indistinct supercilium fulvous; lower plumage pale fulvous profusely streaked dark brown.

Distribution: From Chini in Bashahr State 9,000 ft. (where Waite found it not uncommon) it extends to Sikkim and western China.

General Habits: Gregarious until the approach of the breeding season.

Nidification: A. E. Osmaston found three nests at 13,000 to 13,500 ft. in Garhwal on the borders of Tibet in August, placed low down in bushes. They were composed of strips of bark and grass and lined with fine roots and sheep's wool and hair. The eggs numbered three in each nest and were greenish-blue sparingly spotted and blotched with black round the large end.

174. **Carpodacus rhodochlamys grandis** Blyth. The Red-mantled Rosefinch.

Length: 7 inches.

Field Characters: Male: whole upper plumage, wings and tail rosy-red; rump pure rosy; the feathers on the head and back with dark brown streaks; supercilium; sides of head, chin and throat pale shining rosy; lower plumage rosy-red. Female: upper plumage ashy-brown streaked with darker brown; lower plumage ashy-white, heavily streaked dark brown.

Distribution: Comes to the precincts of Simla in October when it is not uncommon in certain years. Waite found it in summer as far as Namgia at 9,750 ft. on the Tibet border. In winter it descends to the low hills in the Kala Chitta Reserve and the Salt Range, elevation 1,500 ft.

General Habits: Found, in small scattered parties on the barer bush-clad hillsides. Has a low plaintive call-note.

Nidification: Very little known. Hugh Whistler found it not uncommon at Jispar, Lahoul, in June and early July where it was frequenting the juniper forest; he opined that they were on their breeding grounds.

175. **Carpodacus rhodochroa** (Vigors). The Pink-browed Rosefinch.

Length: 6 inches.

Field Characters: Sex for sex this species is a small edition of the Red-mantled Rosefinch; the female being a warmer brown and having a very distinct supercilium.

Distribution: From Dharamsala to Nepal. Comes into Simla from October to March when it is quite common. Descends to 4,000 ft. in winter and breeds at elevations above 8,000 ft.

General Habits: Gregarious in winter, small parties of 6 or 8 birds keeping company. They feed mostly on the ground under bushes in the better forested parts and are tame and of a skulking disposition. The usual call-note is a canary-like *sweet*.

Nidification: Whistler records it as breeding fairly commonly in the high tree zone about 10,000 to 11,000 ft. and quotes Hingston who says down to 7,500 ft. Neither of these authorities, however, gives any particulars regarding the nest and eggs.

176. **Carpodacus erythrinus roseatus** Hodgson. The Common Rosefinch.

Length: 6 inches.

Field Characters: Male: winter plumage; forehead, crown and nape dull crimson; back crimson-brown; lower back and rump rosy-red; cheeks, chin, throat and upper back rose colour; lower breast paler, becoming pure white on the abdomen. Spring and summer plumage, all the colours become intensified. Female: whole plumage olive-brown, streaked darker.

Distribution: In the Simla District this is a passage migrant passing leisurely through in April on its upward journey and hurrying through to its winter quarters in September. Ascends the Himalayas to 10,000 ft. and over. In winter extends over the whole Indian continent to the south.

General Habits: Apart from the breeding season, found in small flocks which feed on the ground particularly in the fields of Indian corn. On the spring migration they do a certain amount of damage to the ripening wheat, and at this season they are very partial to the inflorescence of the White Acacia. Open country is their usual habitat; occasionally met with in open woodland.

NIDIFICATION: June to August is the breeding season. The nest is made of grass-bents and is lined with fine roots and a little hair and is placed in a low bush. The eggs number 3 or 4 and are deep blue, blotched with dark brown or black. The complete moult is performed after their arrival in the plains in September and October.

177. **Procarduelis nipalensis** (Hodgson). The Dark Rosefinch.

LENGTH: 6½ inches.

FIELD CHARACTERS: Male: forehead, anterior part of crown, broad supercilia, cheeks, chin and throat rosy-red; lores and a broad band through the eye over the ear-coverts black tinged with red; upper plumage and the upper breast dusky tinged with vinaceous, each feather margined with sanguineous; abdomen rosy-red. Female: whole upper plumage brown, each feather margined with ochraceous; sides of the head, neck and the whole lower plumage uniform ochraceous-brown.

DISTRIBUTION: The Himalayas from Kashmir to China at elevations between 4,000 ft. to 12,000 ft. or more. Whistler found it common on the Daula Dhar range above Dharamsala at 10,000 ft. to 12,000 ft. from June to September and was confident they were on their breeding ground. In the Simla Hills it is very rare.

GENERAL HABITS: Gregarious after the breeding season.

NIDIFICATION: According to Hugh Whistler there can be little doubt that this species breeds in July and early August, but the nest and eggs have not been described.

178. **Carduelis caniceps caniceps** Vigors. The Himalayan Goldfinch.

LENGTH: 5½ inches.

FIELD CHARACTERS: Sexes practically alike. Forehead, cheeks and chin crimson; upper plumage ashy-brown; rump and upper tail-coverts ashy white; wing black, with a considerable portion of it bright yellow; tail black, the inner webs of the 2 outer pairs largely white, some of the feathers tipped white; throat ashy-white; sides of the breast ashy-brown; abdomen white. The juvenile lacks the crimson on the face, otherwise resembles the adult.

DISTRIBUTION: Resident in the Simla Hills, its numbers are much augmented in the cold weather. It is found from the Afghan border to Kumaon.

GENERAL HABITS: The flocks break up towards the end of March and some of the pairs commence building operations in April. May to July, however, are the usual breeding season. Its food consists of the seeds of thistle *Cyathula tomentosa*. During the breeding season the male has a pretty little song.

NIDIFICATION: Takes place from the end of April to July. The nest is usually placed in one of the coniferous trees from 9 ft. to 30 ft. or more and is generally situated towards the end of a bough. The materials used are mostly white vegetable down and wool, lined with a few strands of hair. The clutch usually consists of 4 eggs. These are pale blue with fine blotches of dark brown and rusty-red mostly at the larger end.

179. **Callacanthis burtoni** Gould. The Red-browed Finch.

LENGTH: 6½ inches.

FIELD CHARACTERS: Male: forehead, lores and a ring round the eye crimson; crown and nape black; cheeks and ear-coverts black with pale shafts; upper plumage and scapulars brown, suffused with rose colour; wings black, the lesser coverts margined with red and the remaining feathers tipped white; tail black, tipped white; lower plumage brown suffused with rosy-red. Female: the crimson of the male replaced by buff; upper plumage ochraceous-brown as in the lower plumage.

DISTRIBUTION: From Kashmir to Garhwal. In the Simla Hills it is an irregular visitor in the winter, some years in considerable numbers, arriving in November and departing in March.

GENERAL HABITS: Highly gregarious. The flocks feeding for the most part on the ground where they eat the seeds of the deodar and other plants; their beaks get caked with resin. Towards the end of their stay the males may be seen indulging in posturing before the females reminding the observer of the display of the Goldfinch. The birds are extremely fearless.

NIDIFICATION: Major H. P. E. Waters is the only ornithologist who has taken the nest and eggs of this bird. This was at Gulmarg on July 10th, elevation 9,500 ft. The nest was 70 ft. from the ground in a deodar. It contained 2 eggs, clear greenish blue with spots and specks of blackish-brown. The nest was a shallow, massive cup made of wiry lichen strengthened by stout, dry twigs, the lining being composed of dry herb stalks and rootlets finished off with a thick lining of hair.

180. **Metaponia pusilla** (Pallas). The Gold-fronted Finch.

LENGTH: 5 inches.

FIELD CHARACTERS: Male: forehead and anterior portion of the crown flame coloured; remainder of crown, nape and sides of neck black with broad grey fringes; back and rump black with broad buff edges, as are the wings and tail; lower plumage yellowish streaked with black. The female closely resembles the male.

DISTRIBUTION: A winter visitor to the Simla Hills, arriving in November and leaving these parts in March.

GENERAL HABITS: A bird of the open bush-clad hillsides where it moves about in small flocks, feeding on thistle and other seeds much after the manner of the Goldfinch.

NIDIFICATION: The Gold-fronted Finch breeds in the Himalayas from Kashmir to Garhwal up to 12,500 ft. The nest is made of grass fibres and strips of bark plastered externally with spiders' web and thickly lined with wool. The nests are placed in juniper trees from 10 ft. to 20 ft. from the ground; occasionally in a briar bush. The eggs usually number 4 and are pale bluish-green marked with rusty-red and dark brown.

181. **Hypacanthis spinoides spinoides** (Vigors). The Himalayan Greenfinch.

LENGTH: 5 inches.

FIELD CHARACTERS: Male: a broad supercilium, some markings on the side of the face, an indistinct collar, the rump and the whole lower plumage bright yellow; remainder of upper plumage greenish-black, darkest on the cap; wings and tail variegated with yellow. Female: a duller edition of the male. In the first plumage the young one is heavily streaked with black or dark brown on the underside.

DISTRIBUTION: Common resident species wandering down to the foothills and some distance out into the plains during the cold weather. Occurs from the Afghan border to Manipur up to 10,000 ft. or more.

GENERAL HABITS: During the cold weather gathers into large flocks which wander about the country in search of food, which consists of all kinds of seeds, and enters the gardens freely to feed on sunflower and *Coreopsis* seeds. The annual moult takes place in April and May. Song and breeding display are very similar to those of the European Greenfinch.

NIDIFICATION: The birds arrive at their breeding stations in June and start building operations in July which, to the end of September, constitutes the breeding season. Their favourite haunts are coniferous forests and groves. The nests are mostly built in deodar trees from 10 ft. to 50 ft. from the ground of small twigs and rootlets and lined with hair and wool. The eggs number from 3 to 5 and are pale blue, sparsely marked with blackish-brown spots and blotches.

182. **Fringilla montifringilla** Linnaeus. The Brambling.

LENGTH: 6½ inches.

FIELD CHARACTERS: Male: winter plumage forehead, crown, nape, hind neck and back are black with broad rufous margins; rump and upper tail-coverts white; tail black, the feathers narrowly margined with white; wing black with two wing-bars, the upper one orange-rufous, the lower one mostly white; sides of head black mottled with rufous; chin, throat and breast orange-rufous; abdomen white; flanks buff, spotted with black. Female much the same as the male differing only in that the black is replaced by brown.

DISTRIBUTION: A rare vagrant to the Simla Hills. I procured a female in my garden on 13-12-24 and Hugh Whistler took several on Kufri Hill 8,800 ft.

on 22-2-25 when he found a flock feeding on the ground. Breeds in the northerly countries of Europe and Asia. It has also been found in Rawalpindi and Gilgit.

GENERAL HABITS: After the breeding season collects into flocks which wander far and wide in search of feeding grounds. Its food consists of seeds which it finds on the ground.

NIDIFICATION: Does not breed in India. In Scandinavia it breeds in May, June and July. The nest is composed of moss, lichen and grass-bents, lined with feathers. The eggs number from 4 to 6 and are pale blue with dark brown blotches.

183. **Gymnorhis xanthocollis xanthocollis** Franklin. The Yellow-throated Sparrow.

LENGTH: 6 inches.

FIELD CHARACTERS: Male: upper plumage ashy-brown; wings and tail brown; lesser wing-coverts chestnut, there are two wing-bars tipped with white or pale buff; chin dusky-white; throat yellow; lower plumage ashy-white. Female differs from the male in having less yellow on the throat.

DISTRIBUTION: A spring and summer visitor to the lower hills up to 5,000 ft. arriving in flocks which soon pair off and take up their breeding stations. [Birds from about Ambala are intermediate with the pale Sind-Baluchistan race *transfuga*.—S.A.]

GENERAL HABITS: A jungle bird found in groves, avenues of trees and the edges of forest. Its call-note is much the same as the typical sparrow's but has a more mellow tone. It feeds mostly on the ground; its diet consists mainly of small seeds and small insects.

NIDIFICATION: Takes place from April to July. The nest is placed in a hole in a tree or other cavity; I once found a pair in possession of a nest of the Rufous-backed Sparrow at Lahore. The materials for the nest are grass, straw and feathers. The clutch consists of 3 or 4 eggs which are whitish, heavily blotched with ashy-brown which almost obscures the ground colour in some specimens.

184. **Passer domesticus indicus** Jardine & Selby. The House-Sparrow.

LENGTH: 6 inches.

FIELD CHARACTERS: Male: crown ashy-grey; a broad band through the eye chestnut, which colour extends to the rump and is streaked with black; rump ashy-grey; tail dark brown, each feather edged with pale brown; wings chestnut at the shoulder followed by two white wing-bars; chin, throat and upper breast black forming a bib; cheeks and lower plumage albescent. Female: Supercilium pale buff; upper plumage pale earthy-brown streaked with black; whole lower plumage ashy-white.

DISTRIBUTION: The whole of India up to 7,000 ft. or more. In Simla every bazaar has its colony.

GENERAL HABITS: Too well-known to need any description. Their food consists of the various grains which they pilfer from dealers' shops, but in the breeding season they make some amends by feeding their young ones on insects of various kinds. Resident in Simla.

NIDIFICATION: The breeding season is from March to June. The nest is placed in any convenient hole in a building safely out of sight of prying eyes; the holes are lined with dry grass and straw and finished off with a warm lining of feathers. The usual clutch is four, but I have known 3 and 5 incubated eggs. The ground colour is very pale greenish-white, blotched and spotted with brown and ashy-grey.

185. **Passer rutilans debilis** Hartert. The Kashmir Cinnamon Sparrow.

LENGTH: 5 inches.

FIELD CHARACTERS: Male: upper plumage cinnamon, streaked with black on the back; wings and tail black edged with rufous; two wing-bars white; chin, throat and upper breast black; remainder of lower plumage greyish-yellow. Female: upper plumage ruddy-brown, streaked on the back with black; rump tinged rufous; a broad buff supercilium; lower plumage ashy-buff, tinged yellow.

DISTRIBUTION: The whole Himalayas from Chitral to China. In the summer it ascends to 8,000 ft. or more; in winter it descends to the foothills and at times out into the plains (Chandigarh).

General Habits : After the breeding season it collects into flocks which frequent the now bare, cultivated tracts where they feed on the ground picking up the fallen grain and the seeds of wild plants. Their call-note is a refined edition of that of the House-Sparrow. In Simla it is found for the most part on the outskirts of the town. Its movements and general demeanour are more refined than those of the House-Sparrow.

Nidification : More of a forest bird than *P. domesticus* and, in consequence, its nest is frequently placed in a Woodpecker's or Barbet's hole. The materials are the same as those of the House-Sparrow. The eggs are usually 4 in number and resemble closely those of that species, but are smaller and generally more heavily marked.

186. **Fringilauda nemoricola altaca** (Eversmann). Stoliczka's Mountain Finch.

Length : 6½ inches.

Field Characters : Sexes alike. Resembles in general appearance a dark slim female House-Sparrow, with a finer bill.

Distribution : Winter visitor to Simla where it first appears at the end of October to March, when it leaves for higher elevations.

General Habits : Highly gregarious and restless frequenting the more open hillsides. Shuns the more sunny sides of the hills and when disturbed flies right away or up into nearby trees. The note is a cheery twitter. Its breeding grounds are among the most desolate wastes, rock scree and desert.

Nidification : The nesting economy of this bird is very abnormal in that the nest is placed inside a marmot's burrow where bird and mammal live peacefully together. The nest is made of dry grasses and lined with wool and hair. The eggs are pure white and number 3 or 4 in a full clutch. The breeding season is July-August.

187. **Emberiza fucata arcuata** Sharpe. The Grey-headed Bunting.

Length : 6 inches.

Field Characters : Forehead, crown, nape and sides of the neck ashy, streaked with black; back reddish brown with broad black streaks; rump reddish brown, faintly streaked brown; shoulder chestnut with black bases, the larger wing feathers brown, edged with rufous; ear-coverts chestnut; a moustachial streak black, which gradually widens to the lower throat where it joins the other streak forming a gorget on the lower throat; chin and throat fulvous; a band of chestnut across the upper breast; lower plumage fulvous streaked with dark brown; tail dark brown edged with rufous, the bases of the feathers show a considerable amount of white when the bird is in flight. The female's plumage is somewhat paler than that of the male.

Distribution : Waite observed a few between Narkanda and Matiana (9,000 ft. to 7,500 ft.) in June. I obtained one at Fagu. It is uncommon in the Simla Hills. It occurs from Kashmir to Assam.

General Habits : Frequents open bush-clad hillsides. Its food consists of grass-seeds and small insects. Apart from the breeding season it appears to be a sociable bird.

Nidification : The breeding season is from May to July. The nest is placed on the ground sheltered under a bush or tuft of grass; it is the usual cup-shaped structure composed of dry grass and is lined with hair. The eggs, usually 4 in number, are pale greenish-grey speckled with dull reddish- and purplish-brown.

188. **Emberiza leucocephala** Gmelin. The Pine-Bunting.

Length : 7 inches.

Field Characters : Male : forehead and crown ashy, streaked with brown, the base of the feathers white; lores, round the eye and a short but broad supercilium, cheeks, chin, throat and sides of the neck chestnut; ear-coverts brown, divided down the middle by a band which extends under the eye to the gape; back rufous streaked with black; rump and upper tail-coverts rufous; tail dark brown, narrowly margined pale rufous, with a considerable amount of white at the bases of the feathers; wings dark brown, the feathers margined with pale rufous; a large patch of white on the lower throat; breast chestnut; abdomen white; flanks white, streaked with chestnut. Female : Lacks the white bases to the white on the head which is ashy, streaked with brown; remaining upper plumage, wings and tail as in the male; it also lacks the chestnut on the face, chin and throat; otherwise the undersides as in the male.

DISTRIBUTION: Winter visitor to India. In the Simla area it arrives in November and passes on down to the foothills and plains. Not observed on the spring migration. In summer it migrates to Northern Asia.

GENERAL HABITS: Gregarious during the winter months. Its food consists of grass seed and any grain, mostly rice, which has fallen on the ground at harvest time and the birds become very fat on this diet. The usual call-note is *zitt.*

NIDIFICATION: I can find no record of this.

189. **Emberiza stewarti** Blyth. The White-capped Bunting.

LENGTH: 6½ inches.

FIELD CHARACTERS: Forehead, crown, nape and ear-coverts grey; a broad black supercilium; the whole upper plumage chestnut; tail brown, margined with rufous, the two outer pairs almost entirely white; chin and throat black; lower throat and fore-neck white; remaining lower plumage pale fulvous. Female: forehead, crown, nape, hind neck, back and scapulars ashy-brown, streaked with blackish; rump and upper tail-coverts chestnut; tail as in the male; wings brown, each feather margined with rufous; lores and round the eye fulvous; ear-coverts and sides of neck brown; lower plumage pale fulvous streaked with brown.

DISTRIBUTION: This is a spring and autumn passage migrant in the Simla area on its way from and to its breeding grounds which lie further in the interior as Waite saw it frequently from Nachar to Poo and again between Sarahan and Baghi. Stoliczka found young about the middle of June.

GENERAL HABITS: Gregarious in the cold season, the flocks frequenting the open bush-clad slopes where they feed on the ground. The flight is undulating and graceful like all the Buntings.

NIDIFICATION: Breeds in June and July, making a cup-shaped nest of grass-bents and fibres lined with hair and wool. It is placed on the ground under the shelter of a bush or a clump of overhanging grass. Eggs number from 3 to 5. They are white mottled and blotched with dark brown and pale purplish-grey.

190. **Emberiza cia stracheyi** Moore. The Eastern Meadow-Bunting.

LENGTH: 6½ inches.

FIELD CHARACTERS: Sexes alike. Head, throat and upper breast bluish-grey marked with two broad black coronal stripes; a black line through the eye and encircling the ear-coverts; remainder of the body plumage chestnut brown, which on the back is streaked with black; wings dark brown, the feathers edged with rufous and chestnut; tail dark brown edged with chestnut, the outermost feathers with conspicuous white tips.

DISTRIBUTION: Resident, with some downward movement in the cold weather. Found from the foothills in winter to 10,000 ft. in the breeding season, from Gilgit to Kumaon.

GENERAL HABITS: The Meadow-Bunting is a bird of the open grassy, bush-clad hillsides, rarely entering forested country. In the cold season it collects into flocks which feed on the ground in their search for seeds, grain and small insects.

NIDIFICATION: The breeding season is from April to September. The nest is placed on the ground or, exceptionally, in a thick bush. One in my garden was in a honeysuckle bush 3 ft. from the ground and contained 4 eggs—the only time I have known this number—the usual clutch being 3, sometimes only 2. The nest is made of grass-bents and roots and lined with hair. The eggs are stone-colour marked with lines and scrawls of blackish-brown.

191. **Melophus lathami subcristata** (Sykes). The Crested Bunting.

LENGTH: 6 inches.

FIELD CHARACTERS: Male: entire plumage, including the crest, black except the wing, tail and thighs which are chestnut. Female: Crest and upper plumage dark brown; lower plumage dull buff, streaked and mottled on the throat with dark brown, getting more rufous under the tail.

DISTRIBUTION: A summer visitor to the lower hills from 2,500 ft. to 5,000 ft. Common at the lower elevations. It extends from the Hazara country to Assam and China.

GENERAL HABITS: Much the same as the other buntings except that it seldom perches on a bush, preferring a rock for its look-out and song perch. After the breeding season the birds band together, sometimes forming considerable flocks.

NIDIFICATION: The breeding season is from June to August, most nests being found in July. The materials employed are grass-bents and fine rootlets, and for the lining fibres and hair. The nest is placed on the ground under a rock or in a hollow of some accommodating dimensions where it is well screened from view. The clutch consists of 3 or 4 eggs which are white or stone-coloured, blotched with red, brown and purple.

192. **Delichon urbica urbica** (Linn.). The House-Martin.

LENGTH: 6 inches.

FIELD CHARACTERS: Sexes alike. A black and white Swallow-like bird Upper parts from forehead to rump black, glossed with metallic blue; rump pure white; upper tail-coverts, tail and wings black, glossed with blue; cheeks, ear-coverts and lower plumage white. Legs and feet feathered white to the toes.

DISTRIBUTION: Passes through the Simla area in May in large flocks, returning in smaller numbers in September and October on the downward migration. In winter it is found as far south as the Nilgiris and in summer up to 12,500 ft. in the Himalayas.

GENERAL HABITS: Highly gregarious, even in the breeding season the nests are clustered closely together under over-hanging ledges of cliffs. Its food is flying insects which are taken on the wing.

NIDIFICATION: The nest is constructed of mud pellets and is lined with feathers and a little grass. The eggs number from 3 to 5 and are white very rarely marked with pale red spots at the large end.

[Mr. Jones's collection has 2 skins also of Hodgson's House-Martin (*Delichon nipalensis* Hodgs.) collected at Ranibagh, Kumaon, on 13 and 28 Jan. 1942.]

93. **Riparia paludicola brevicaudata** (Horsf.). The Indian Sand-Martin.

LENGTH: 4½ inches.

FIELD CHARACTERS: Sexes alike. Upper plumage greyish-brown; wings and tail darker brown; chin, throat, breast, sides of head and neck pale grey; abdomen, vent and under tail-coverts white.

DISTRIBUTION: In our area only found in 1 or 2 localities down on the Sutlej River, near Suni. Widely spread over the whole of Northern India.

GENERAL HABITS: This is a bird mostly found near water at low elevations. It flies tirelessly over the water where it catches its food which consists of flies, mosquitoes and other winged insects.

NIDIFICATION: Breeds in colonies in the sandy banks of rivers. For the nest they first tunnel into the earth for 2 or 3 ft. at the end of which the nest-chamber is made and here the nest is made of a few whisps of dry grass with usually 2 or 3 white feathers. The eggs number from 3 to 4 and are white without markings.

194. **Riparia riparia diluta** (Sharpe & Wyatt). The Sand-Martin.

LENGTH: 5 inches.

FIELD CHARACTERS: Distinguished from the Indian Sand-Martin in having a well defined band across the upper breast and a tuft of small plumes at the back of the tarsus.

DISTRIBUTION: A passage migrant passing over these Hills in May and returning in September on its way to the plains.

GENERAL HABITS: Same as the foregoing species.

NIDIFICATION: Differs in no way from the Indian Sand-Martin. It does seem worth mentioning here that I have found this sub-species breeding at Attock and Sukkur on the Indus and as far east as Madhopur on the Ravi in February and have collected both birds and eggs at each of these localities. These have been examined by Whistler, Ticehurst and Meinertzhagen. The problem now is what becomes of the birds of these colonies after they have finished breeding? Are these the birds seen by Sálim Ali in Tibet at 15,000 ft. and by myself here in Simla on passage in May and September? Sálim Ali (*J.B.N.H.S.* pt. 2, Vol. 46, page 301) 'presumed breeding'. Could it be that this bird breeds both in the plains of India and up in Tibet at 15,000 ft.?

195. **Riparia rupestris** (Scopoli). The Crag-Martin.

LENGTH: 6 inches.

FIELD CHARACTERS: Sexes alike. Upper plumage, sides of head, wings and tail ashy-brown; a large white spot on the inner web of all tail feathers, except the middle and outermost pairs; chin, throat and breast white, tinged with pale rufous, the chin and upper throat spotted with brown; abdomen and flanks rufous-ashy; under tail-coverts dark ashy-brown.

DISTRIBUTION: A winter visitor to Simla from the middle of September to March from 8,000 ft. down to the foothills. The whole Himalayas down to Tenasserim (? winter). Waite observed it in the Sutlej Valley from Wangtu to Namgia in May and Sálim Ali found it breeding in Tibet in June.

GENERAL HABITS: This Martin is usually seen beating backwards and forwards across the face of a cliff, feeding on such winged insects as it can catch. It roosts on the ledges of cliffs.

NIDIFICATION: Breeds from April to June or later making a nest of mud pellets lined with dry grass and a few feathers. The nest is placed under a ledge of a cliff. The eggs usually number 4 and are white spotted with red and purple.

196. **Hirundo rustica rustica** (Linnaeus). The Swallow.

LENGTH: 8 inches.

FIELD CHARACTERS: Forehead, chin and throat chestnut; upper plumage and wings black glossed with metallic blue; tail black suffused with glossy green, all the feathers, except the middle pair, with a white patch on the inner web; sides of head, neck and a broad pectoral band glossy black; lower plumage pale rufous. Sexes alike.

DISTRIBUTION: In Simla excessively rare. I found it breeding commonly in Suket State across the Sutlej River. In winter the whole of India.

GENERAL HABITS: Highly migratory. Feeds mostly on winged insects which it takes on the wing but on the outskirts of Peshawar I once found a number feeding on black ants which they were taking on the ground. The flight is much swifter than that of the Red-rumped Swallow.

NIDIFICATION: The breeding season is from April to August. The nest is made of mud pellets lined with dry grass and a few feathers. The clutch numbers from 3 to 5; in colour the eggs are white marked with dark red and purple blotches and spots.

197. **Hirundo smithii filifera** Steph. The Wire-tailed Swallow.

LENGTH: To tip of ordinary tail-feathers 5 inches; the wire-like outer tail-feathers 7 inches extra; rather shorter in the female.

FIELD CHARACTERS: Top of the head bright chestnut; sides of the head, neck and the whole upper plumage glossy steel-blue; all the tail-feathers except the two central pairs with a white spot on the inner web; lower plumage white.

DISTRIBUTION: A summer visitor to the Simla Hills breeding from the foothills up to about 7,000 ft. (Tara Devi). Resident and widely spread in the plains.

GENERAL HABITS: Do not differ from those of the other swallows.

NIDIFICATION: The nest is a smaller edition of *H. rustica* and is shallower. The eggs also resemble those of that species.

198. **Hirundo daurica erythropygia** Linnaeus. The Red-rumped Swallow.

LENGTH: 6 inches.

FIELD CHARACTERS: Sexes alike. Upper plumage glossy steel-blue, except the rump which is chestnut; an indistinct white patch on the inner web of the outermost tail-feathers; ear-coverts and a more or less distinct collar round the neck chestnut; the whole lower plumage pale rufous, finely streaked with brown.

DISTRIBUTION: A summer visitor, arriving in March and leaving the Hills in September. Also breeds commonly on the plains.

GENERAL HABITS: Takes practically all its food, which consists of winged insects, on the wing. The flight is graceful but not fast. After the breeding season it collects into large flocks, often seen on telegraph wires.

NIDIFICATION: The breeding season is from April to August. The nest is built of mud pellets brought, one by one, by the birds. After a certain portion has been put in place this is allowed to dry before work is continued; the entrance to the nest is through a bottleneck prolongation of the mud work, usually 5 or 6 inches long. The nest chamber is lined with dry grass and feathers. The eggs number 3 or 4 and are unmarked white.

199. **Hirundo daurica nipalensis** Hodgs. Hodgson's Red-rumped Swallow.

LENGTH: 6½ inches.

FIELD CHARACTERS: Sexes alike. Differs from the last-mentioned bird in having the rump a pale rufous and the striations on the lower plumage much coarser.

DISTRIBUTION: In summer found from 6,000 ft. to 9,000 ft. Distributed all along the Himalayas.

GENERAL HABITS: The vanguard of this swallow often arrives at their breeding stations at the end of January if the weather is fine; if the weather changes these birds return to lower altitudes. They leave the Hills in September.

NIDIFICATION: Same as for *H. daurica erythropygia.*

[There is obviously some confusion in the breeding records. Surely it cannot be that both the races *erythropygia* and *nipalensis* breed in the same area!—EDS.]

(To be continued)

SOME BIRDS OF THE GANDAK-KOSI WATERSHED, INCLUDING THE PILGRIM TRAIL TO THE SACRED LAKE OF GOSAINKUND

BY

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Two mountain passes guard the road to Katmandu. The visitor who is fortunate enough to cross the second of these, known as the Chandragiri pass, on a clear day will see one of the finest mountain views in the world, one that will live long in his memory. Spread out at his feet, 2,500 feet below, is the fair vale of Katmandu, a green expanse of rice and other crops with the towers and gorgeous palaces of the town in the middle distance; on the north this fertile basin is bounded by the forest-clad ridge of Sheopuri, whence the watershed of the Gandak and the Kosi—those two great tributaries of the Ganges that rise in Tibet and drain large areas of Nepal—leads the eye up to a dark and jagged curtain of naked rock that runs up to the snow peaks of the Nepal-Tibet boundary, the main crystalline axis of the Himalayas. From the highest point of the Chandragiri ridge, some four miles east of the pass, can be seen no less than six peaks of over 26,000 feet:—Daulagiri (partly concealed), Ananpurna Himal, Himalchuli, and Manaslu in the west; Gosainthan due north; Everest in the east.

A collection of mountain tarns known as Gosainkund, sacred to the worshippers of Vishnu, lies high up (at about 14,000 ft.) on the western side of the Gandak-Kosi watershed; and every year in August, when the monsoon is in full force, large numbers of pilgrims undertake the arduous journey to these lonely lakes. From Katmandu the first 9 miles is by motor road to Sundari-jal (= Laughing-water, a name no doubt suggested by the stream that comes cascading down to the valley at this point), whence a rough track climbs steeply to the Sheopuri ridge; from here the trail follows the Gandak-Kosi watershed to a point marked Thare Pati on the map at an elevation of about 12,000 ft., and then turns off left to traverse the tremendous cirque of precipices at the head of the Tadi Kola, eventually climbing to a 15,000 ft. pass some 5 or 6 miles short of the lakes.

What ornithologist, sweltering perhaps in the dusty plains of India or the steamy teak forests of Burma, has not pored over the descriptions of birds found only at high elevations in the Himalayas: such intriguing birds as the Great Parrotbill, the beautiful Blue Grandala, the Golden Bush Robin, the gorgeous Rosefinches, (and if he be shikari too) the Monal Pheasant, the Tragopan, the Snow Partridge, and the Snow Pigeon: and wondered whether he would ever be privileged to see them in their mountain homes? He could scarcely have hoped to see them in this part of the world, for the Nepal Government very rarely allows outsiders to travel in the Nepal Himalaya and the visitor to Katmandu is not allowed outside the valley; there is a photograph of Gosainkund lake in Landon's book on Nepal, taken by Oldfield many years ago, but I do not know of any other outsider who has ever followed the pilgrim trail. The writer was therefore very fortunate in obtaining sanction to accompany Lt. Tej Jung Thapa, an officer of the Nepal Forest Department, on a fortnight's tour in this area; the stipulation was made that I should not go within 5 or 6 miles of the sacred lake.

The tour started on the 1st September, and the area is covered by Survey of India 1" sheets 71. H and 72. E. The first three days took us from Sundari-jal to Thare Pati, a distance of about 22 miles. For the first two days the path keeps to the crest of the Gandak-Kosi watershed, rising and falling between 5,500 ft. and 8,300 ft., and runs mostly through scrub or past terraced fields of Indian corn; high forest is seen only on the summits of the peaks traversed, and consists mainly of *Quercus semecarpifolia*, with some *Q. lanuginosa*, mutilated by lopping for buffalo fodder and therefore ugly to look upon, and harbouring few birds. The Himalayan Greenfinch is commonly seen all along this section.

On the second evening we camped at a place known locally as Tarkol, but not named on the map. The camp site has, no doubt, a fine view, but the mists never revealed it to us; it swarms with leeches, and a mosquito net had to be put up to keep them off at night. From here the trail, still keeping to the watershed, rises steeply for 3,000 ft., first through oak forest, then through a dense closed canopy of *Rhododendron arboreum*, finally emerging near the top into a different world.

Nature's garden: a world of Silver Fir, of high-level Rhododendrons, of Juniper, of Berberis, and above all of flowers; a world of colour in great variety. There were the young Silver Fir cones, a dark purple-blue; a *Polygonum* (? *sphaerostachyum*) with neat cylindrical heads of numerous small flowers in a compact cluster, of a beautiful carmine-pink set off by the black anthers of the stamens; a delicate mauve *Pedicularis* growing in groups with a corolla that turns over to form an umbrella in wet weather thus protecting the long curved style and stigma; a primrose-yellow Balsam; a large pale blue *Aster* (*thompsoni*?); a beautiful *Corydalis* (*crithmifolia*?) yellow with purple tips; *Primula denticulata*, one of the loveliest flowers I have seen, rising on a 10″ stalk from a rosette of leaves, the head a cluster of blue-mauve flowers with a yellow ring at the base of the corolla and above that a purple ring, exhaling a delicate perfume; and many other flowers.

Then there were the shrubs; *Berberis vulgaris* with its coloured leaves, pink fruits, and three-pronged spines; a *Vaccinium* with light blue berries, perhaps those referred to by Shipton ('Nanda Devi', p. 220) as being considered a delicacy in Sola Kombu, though no-one seems to eat them in these parts; and finally the Rhododendrons covering the hill-sides (what a wonderful sight they must be when in flower); *R. falconeri* with its thick leaves gone rusty beneath; *R. barbatum* with its green leaves and pink bark; *R. campanulatum* with thin papery bark and leaves a delicate cinnamon colour below.

And so we came to Thare Pati, a collection of huts with stone walls and roofs of rough-hewn fir planks laid loosely on top of each other, maintained by the Government to shelter pilgrims. A more magnificent site it would be hard to conceive. Most of the huts are built on a grassy alp, sprinkled with the pink *Polygonum*, just below the crest of the ridge, at an altitude of about 12,000 ft. Facing the camp is the cirque of precipices round the headwaters of the Tadi Khola, already mentioned, terrific slopes of grass and threatening rock and foaming torrents dropping 8,000 ft. from the snow-capped heights above to the slit-like valley floor far beneath; across these precipices runs the slender thread of the pilgrim trail. From the crest of the ridge behind the camp one sees, across the valley of the Malemchi Khola running 7,000 ft. below, the ridge called Dhukpu on the map along which runs a path to the Ganja La, an 18,450 ft. pass across the Gandak-Kosi watershed; to reach this pass was our objective. Over the Dhukpu ridge appear the fine snow peaks of Jugal Himal, Gaurisanker, and others in the direction of Everest. Looking south the eye follows down the ridge by which we have come to familiar landmarks of Katmandu: Sheopuri, Nagarjun, Kakani bungalow, and the Chandragiri pass, and sweeping on over blue foothills sees the cloudless glare that marks the sweltering plains.

It was on my return that I halted here a day (13th September) to explore the last section of the pilgrim trail; I planned to reach the 15,000 ft. pass 5 or 6 miles short of the lake (beyond which point I was not allowed to explore) at 8·00 a.m., at which hour if the day were fine the view would still be unobscured by clouds. Although the route was there in front of me, I under-estimated by 2½ hours the time it would take to reach the pass, so deceptive is the scale of these mountains.

After an early breakfast I set out at 2-30 a.m. with my Gurkha orderly; the stars were shining, giving false promise of fair weather, and in the absence of a moon we could proceed but slowly over the rough track by feeble lantern light; we crossed a spur at 5·00 a. m. and rested for 10 minutes, after which the track being visible by the light of dawn we hid the lantern under a convenient boulder. Dawn broke grey and cheerless with the pass and the higher peaks before us swathed in mist, and a cold drizzle started soon after 6·00 a.m. to continue without respite through the day.

By 7·00 a.m. we had reached the small bridge (three fir poles lashed side by side) crossing a side torrent that marks the end of the traverse and the start of the climb to the pass; for all the terrifying aspect of the traverse as seen from a distance, the path has been so aligned that nowhere does one have to look down dizzy heights, though the towering cliffs above are often an imposing sight. *Primula denticulata* grows abundantly beside the path, being a lover of moist localities; above the bridge a Brown Dipper and a Little Forktail were working their way upstream, while a pair of White-capped Redstarts bobbed and fussed about the nearby rocks. The bridge itself is lower than Thare Pati, and the pass would appear from the contours on the map to lie at 15,000 ft. so the final climb must be more than 3,000 ft. The path leads up through a rocky terrain in its lower levels completely carpeted with a yellow *Potentilla*, now mostly bearing fruit like small black berries but assuredly a fine sight in full bloom; here and there a short-stalked pale blue Gentian grew; and at one place from the rocks above came the shrill whistles of a covey of Snow Partridges.

At 9·00 a.m. we reached the top, unexpectedly ornamented with a vast pile of walking sticks heaped up here by the pilgrims a month ago; one can picture the relief and joy with which they attain this point, with nothing but a gentle descent of 5 or 6 miles between them and their goal, after the considerable hardships they must endure, ill-clad and ill-provided for mountain travel as they are, from the persistent driving rain and the cold and rarefied air of this elevation.

Crouching in the lee of a large boulder we ate and rested for half-an hour, looking down on the little lonely mountain tarn of Surja Kund, or as much of it as we could see in the driving mist. As visibility never increased beyond 200 yards and there was no hope of the weather improving we reluctantly began the descent at 9·45. I was wearing locally-made rope-soled shoes. which proved about as tough as wet blotting paper on that path of granite chips and boulders, so that the return walk of 6 hours back to camp was done mainly on the bare soles of my feet. I spent some minutes observing a marmot at the mouth of its burrow; it appeared to lack a tail, but otherwise in size and appearance was something between a large rat and a small rabbit; the front part was reddish, and the back and rump blackish-brown. These animals are common at this level, and we often saw them vanishing into holes in the ground.

We had intended to halt a day on the 4th to do the above trip, but the weather being unfavourable we decided to postpone the attempt until our return, arguing that the weather could not be worse (it was), and accordingly moved camp to Malemchigaon, a Sherpa village perched on a shelf of the hillside 4,000 ft. below. It had rained hard early in the night, and dawn disclosed heavy rain clouds blowing up from the south. We left at 7·15 and dropped steeply down, first through Juniper, Silver Fir and Rhododendron scrub, and then lower down through Silver Fir high forest with Rhododendron undergrowth. Brandis ('Indian Trees' p. 692) states that he has never seen *Abies pindrow* and *Abies webbiana* growing together, so it was of interest to see them growing here side by side; some of the trees were fine specimens and had attained 18 ft. in girth.

The Chini Lama of Boddnath (a famous Buddhist shrine near Katmandu) spends the summer in Malemchigaon, where he maintains a monastery. He is an interesting character and speaks many languages, including English, Nepali, Sherpa, Hindustani, and several Tibetan and Chinese dialects; he belongs to the red-hat sect of Tibetan lamas, which permits marriage, and once went on pilgrimage to Shigatse but was prevented by illness from going on to Lhasa as he had hoped to do. He invited us into his house, and we mounted to an upstairs room floored and roofed with short wide rough-hewn planks of Silver Fir, and ornamented chiefly with brass and iron cooking pots of various dimensions. A fire was burning in the back centre of the room, and over the hearth was suspended a platform on which numerous large packets of goats' meat, neatly done up, were being smoked. His kindly wife brewed us some Tibetan tea, complete with tsampa, which we found a pleasant warming drink; we drank countless cups while talking to the lama, who drank his tea from a beautiful jade cup in a silver and gold mounting.

In the evening he arranged a village dance, in which half a dozen men and as many women performed; the dance consisted in tapping or stamping the feet while singing (I found it an excellent method of warming the feet, which was perhaps how it originated!). At first the performers were shy, but warmed up after several rounds of rice spirit had been served in bright brass bowls, and the singing was robust and melodious, with an attractive rhythm. At intervals a villager would come before the lama and receive a benedictory pat on his bared head.

The Sherpas of these parts are of Tibetan appearance, and some of the women have fair complexions with pink cheeks. They keep buffaloes, chumries (a cross between a cow and a yak), sheep and goats, and for their staple food grow potatoes and Indian corn in terraced fields. The herdsmen live a semi-nomadic life, constructing temporary huts with stone walls roofed over with long rolls of bamboo matting, and moving their animals from time to time according to the dictates of the grazing or the season. The men are powerfully built and wear long tight trousers like the Nepalese, and rough weather-proof homespun woollen jackets with or without short sleeves. The women dress much like the Nepalese and wear ornaments of coral, turquoise, gold, silver, and onyx, this last apparently the stone most highly prized in Tibet. At times the men indulge too freely in rice spirit and fights ensue, sometimes with fatal results; one elderly whiskered gentleman wno accompanied us to the Ganja La as a shikari was ' wanted ' for three murders, and I was told of a wealthy young man who wished to do away with a rival in another village and successfully liquidated him by means of hired assassins. The Sherpas seem to smoke mainly cigarettes, which they pass from hand to hand, or occasionally a hookah, in contrast to the pipe-smoking hill tribes of Burma. The odour of rancid butter is all-pervading, emanating most strongly from the women, who do most of the butter-making, and noticeable in all the houses. Wood carving is a hobby with the Sherpas, as with the Nepalese, and is the chief interior ornament of their houses. The work is well done, and the chief themes are: a conch shell; an elephant; and what appears to be a dragon surrounded by leaves, but is meant to represent lightning and thunder in the clouds.

Early next morning the lama showed me round his monastery, a stone building with wooden floors and roof of about the same size as his house; prayer flags flutter outside, and on the left of the entrance porch is a large prayer-wheel. The interior consists of one room containing images representing five manifestations of the Buddha, one of them identical with the seated Buddha to be seen all over Burma, and elaborate mural paintings, executed by an artist from Lhasa in 1935; the paintings represent Buddhas and their disciples, and took three months to complete, the fee charged being Rs. 2 per day plus free board and lodging. The lama explained the significance of the various images and paintings, but I was not sufficiently *au fait* with Tibetan Buddhism to follow all he said. The room also contained a conch shell, blown at times of worship, a large drum, butter lamps, offerings of barley and maize, a pair of millstones, and several pieces of cloth; these last are apparently offered by the bereaved on the death of a near relation, whose name is written on a piece of white cloth at the top.

We left at 9·00 a.m., descending over 2,000 ft. to the Malemchi Khola, a roaring torrent fortunately bridged, and climbed the same height up the far side along a leech-infested path through terraced fields. At 2·30 p.m. we reached Tarke Gyang, a larger and more prosperous village, the houses crowded together on a shelf of the steep hillside. While the tents were being put up we looked at the local monastery (apparently every village has its own lama and monastery). The chief feature was an enormous prayer wheel, about 10 ft. in height by 20 ft. in circumference, which is turned by hand and rings a gong at each revolution to mark the mounting toll of merit. The monastery was two-storied with mural paintings, old and rather tarnished, on both stories; some beautiful paintings on cloth, the work of a local artist, were hanging in the upper room.

No white face had ever appeared in these Sherpa villages before, and that evening my tent was besieged by curious villagers, mainly women and children, while my servant's cooking operations on a Primus stove proved an attractive side-show; only when darkness fell were we left in peace.

The coolies had to prepare rations (mostly Indian corn crushed and roasted, in which form it can be eaten without further cooking) for the next few days, and this delayed our start the following morning till just before mid-day. The first two hours of the march were up a vile and slippery track, crawling with leeches but brightened by a variety of fine balsams, pure yellow, deep purple, white, and pink, that flourish in wet forest; it took us up 3,000 ft. to a hut on the shoulder of Yangri (12,443 ft.) and was a short-cut, the main path reaching the hut by a more roundabout route. We continued on up the ridge for some distance and pitched camp at an altitude of about 12,000 ft. I was surprised to find the leeches troublesome even at this height, and put up the mosquito net to keep them off at night. After sunset the mists cleared for a few moments to show the snows of Jugal Himal in the north-east, but the weather made up for this momentary weakness by its ferocity on the following day.

Dawn revealed an overcast sky and heavy clouds rolling up from the south, and as we started at 7.40 a.m. the rain commenced; we climbed steadily in the drizzle, the track at first following the crest of the ridge and then traversing well below it on the east side. At 11.40 a.m. we had lunch in the shelter of an overhanging boulder, and thereafter the weather became worse, a strong wind driving sheets of rain across the ridge from east to west. The coolies had no clothes warmer than those they wear in Katmandu, and their cheerful endurance of the unpleasant conditions was remarkable; the camping ground was eventually reached at 4·30 p.m. and it was dark before we settled in, it being necessary to send back two of the Sherpas to carry the loads of coolies who had become exhausted. Rain and mist interfere seriously with bird observation, but they do not obliterate the flowers, and of the sights seen this day a pink *Vaccinium* that covers patches of hillside and resembles heather at a distance, and a deep blue Gentian or Campanula scattered profusely on a hillside of Potentilla leaves were the most memorable. At dusk the mists cleared a little to reveal a hanging glacier across the valley high above the camp.

The camp was pitched on easy grassy slopes sprinkled with yellow flowers below a small hill with a cairn on its summit, at an elevation of perhaps 15,000 ft. Our plan was to halt two days and to go up to the Ganja La on whichever day might be the finer; as it turned out both days were equally wet, but the first day being unpromising Lt. Tej Jung went out after Tahr and I pottered round the camp in search of birds. We were above the Juniper zone and the only shrubs that grew were two species of dwarf Rhododendron: *R. lepidotum* which covers large areas of hillside and gives out a delicious fragrance underfoot; and *R. setosum*, of more resinous scent, growing in mixture with the former; both species ascend to about 16,000 ft. Near the camp I saw a butterfly of the genus *Parnassius* (Snow-Apollo), the only interesting butterfly seen on the trip. I climbed up towards the crest of the ridge, and saw a small flock of Snow Pigeons; higher up a brace of cock Monal Pheasants, which got up out of a patch of boulder scree scarcely 10 yards from me and flew protesting down the hill, afforded a magnificent sight with their metallic purple plumage, white rumps, and cinnamon tails.

The rain continued all night and well into the next morning; however we left for the pass at 9·00 a.m. and the rain stopped for two hours, which enabled me to observe a flock of Hodgson's Grandalas, those beautiful blue birds I had hoped to see up here; we also saw a dozen or more Monal Pheasants and a covey of Snow Partridges, and I watched a Nepal Wren hopping in and out of the rocks in a patch of scree. After going about 2 miles from camp we rounded the base of a cliff and topping a small rise looked down into a wide flat valley. This would be the best camp site, sheltered to some extent from the wind and lying close up to the backbone of the ridge, for exploring the surrounding mountains, but firewood would have to be brought up from below. A Brown Dipper was observed on the stream. Crossing to the upper end we entered a side valley, the entrance being marked by a rock the size of a large house, and started climbing in earnest; passing a prominent concave stone shute on our right we eventually reached the crest of a spur near a small but massive hanging glacier; crossing some snow-covered rocks and then half a mile of snow-field in a soggy melting condition and of a nasty bluish tinge like föhn snow in the Alps, we reached the foot of a steep but easy scramble of about 200 ft. that took us to the top of the pass (18,450 ft.). The path is not well marked in several places and the pass would not be easy to find without a guide. At this height the rain had changed to sleet, and visibility was limited to about half a mile.

Descending a few steps on the far side we sat down out of the wind for a rest. The path dropped down the rocks below us for 100 ft. and then crossed a small glacier to a scree-strewn valley, bearing north-east from where we sat, which disappeared from sight round a spur. East and west the ridge rose steeply in shattered cliffs and an attempt to advance far in either direction would have involved difficult rock climbing. From the pass itself the view is very restricted by neighbouring spurs, and the fine snow pyramid of Langtang Lirung (23,771 ft.) which lies about 10 miles to the north-west, is probably not visible. The path leads down to the Langtang Khola (a tributary of the Gandak) and across the valley is the Tibet border, the nearest point being about 7 miles in an air line, but there is no pass across the main range in this area. The Ganja La is a little used pass, and is open only for two or three months in the year. We started down at 2·45 and reached camp three hours later.

We marched back the next day; I halted at the foot of peak 14,934 ft., in the fond hope of obtaining a view from the summit either that evening or early the following morning, while Lt. Tej Jung carried on to Tarke Gyang, his coolies having run out of food. Golden Bush Robins were commonly seen this day.

The following morning I left camp at 6·25 a.m. and reached the top of the peak at 7·25. The sun was actually shining and Gaurisankar and other snow peaks to the east were clear, but the nearby ones were veiled in cloud. It was very pleasant sitting up there, at the height of the summit of the Matterhorn, until the mists, rising all too quickly from the valleys, blotted out the view. Looking north the eye followed the Dhukpu ridge to its junction with the Gandak-Kosi watershed, but the Ganja La itself was not visible; to the left one looked down immense depths to the Malemchi Khola. 7,000 ft. below, while in the foreground a jade green tarn nestled on the shoulder of a mountain. Looking south one saw, far below, the little cluster of huts on the green hillside that was Malemchigaon, which we reached the same evening. We stopped at Tarke Gyang on the way down; Lt. Tej Jung had arrived the previous evening, and we now parted company, he to return to the Ganja La and over it into the Langtang Khola (where he shot a Tahr) and I, unwillingly, to Katmandu, my leave being nearly up. I arrived back on the 15th September, and my only regret was that I had been unable to devote two months, instead of two weeks, to the mountains of the Gandak-Kosi watershed.

NOTES ON BIRDS SEEN

The names and serial numbers are taken from *The Fauna of British India —Birds*, 2nd edition, by Stuart Baker. For want of suitable ammunition no specimens were collected. The mountains of the Gandak-Kosi watershed are the nearest high mountains to Katmandu, and it is probable that many of Hodgson's type specimens of mountain birds came from this locality.

8. **Corvus macrorhynchos.** Jungle Crow.

Seen round villages and huts up to 14,000 ft.

22. **Urocissa flavirostris.** Yellow-billed Blue Magpie.

Seen above Tarkol at about 8,500 ft., but not higher.

46. **Nucifraga caryocatactes.** Himalayan Nutcracker.

Several pairs seen round Thare Pati on hillsides covered with Silver Fir—Rhododendron scrub. The white outer tail feathers and the loud harsh call-note are distinctive features.

48. **Pyrrhocorax pyrrhocorax.** Red-billed Chough.

Several pairs seen round our top camp below the Ganja La at 15,000 ft. The call-note is high-pitched.

65. **Lophophanes rubidiventris.** Rufous-bellied Crested Tit.

One of the most characteristic birds of the Rhododendron scrub zone at 11,000—13,000 ft. The birds of which I had a good view appeared to have rufous on the centre and sides of the breast and an ashy patch in between.

68. **Lophophanes dichrous.** Brown Crested Tit.

A small mixed party of this and the preceding species was noted at 11,500 ft. below Thare Pati in open tree and rhododendron forest. Grey above, tawny below, with an interrupted buff collar on the hind neck and a full crest. I thought at first it was a *Yuhina* or *Ixulus*, to which genera it has a curious resemblance.

70. **Sylviparus modestus.** Yellow-browed Tit.

Not uncommon in scrub up to 14,000 ft. and makes its presence known by a curious grating *churr* ; in habits it is shy and rather a skulker, spending much time concealed in dense bushes.

89. **Conostoma aemodium.** Great Parrotbill.

I had an excellent view of a pair of these birds in a bush at 11,000 ft. near Thare Pati, and watched them for some minutes preening each others feathers. The orange bill, whitish forehead, dark lores, and mouse brown plumage are diagnostic ; except for the bill it resembles a large Laughing-Thrush.

148. **Trochalopteron erythrocephalum.** Red-headed Laughing-Thrush.

One of the commonest birds up to the upper level of oak forest (say 9,000 ft.) but not seen at higher elevations.

161. **Trochalopteron affine.** Black-faced Laughing-Thrush.

Common round Thare Pati and along the pilgrim trail thence to Gosainkund, in rhododendrons at 11,000—13,000 ft. It has a melodious call-note *to-we*, *to-we-you*, and harsh churring alarm-notes. Contrary to the statement in the Fauna, I saw it always in parties, not pairs.

171. **Trochalopteron lineatum.** Streaked Laughing-Thrush.

Seen round Malemchigaon and Tarke Gyang villages (both 8,000 ft.) ; it appears to like being near houses and one bird had its abode close to Malemchigaon monastery.

304. **Fulvetta vinipecta.** Hodgson's Fulvetta.

Fairly common in parties in rhododendron and Juniper scrub at 11,000–12,000 ft. A very active tit-like bird, constantly uttering a high-pitched *chip*, *chip* call-note that indicates the presence of a party. A broad white eyebrow starting from above the eye, brown crown, ear coverts and patch over the eye white chin and throat, and earlier primaries edged with bluish-grey, are noticeable field characters.

326. **Ixops nipalensis.** Hoary Barwing.

Common in the upper oak forests at 7,000—9,000 ft., but not seen above ; possibly it goes higher when the rhododendrons are in flower.

333. **Siva strigula.** Stripe-throated Siva.

Common in parties in rhododendron scrub at 10,000—11,000 ft. and also seen lower down in oak forests at 7,000 ft.

448. **Certhia familiaris.** Nepal Tree-creeper.

Several birds were seen in a patch of open forest just below Thare Pati at 11,500 ft. The birds hunted over mossy boulders as well as tree-trunks.

458. **Troglodytes troglodytes.** Nepal Wren.

Seen both in rhododendron-juniper scrub and on bare boulder-strewn hillsides up to 16,000 ft. The habits are well described in the Fauna.

479. **Cinclus pallasii.** Brown Dipper.

Seen on the Ripar Khola at 15,000 ft., on the way to the Ganja La, and also at 12,000 ft. on rocky streams below the pilgrim trail.

502. **Rhodophila ferrea.** Dark Grey Bush Chat.

Seen amongst berberis-juniper scrub at 11,000 ft.

525. **Microcichla scouleri.** Little Forktail.

One bird seen at 12,000 ft. where the pilgrim trail crosses the Tadi Khola.

534. **Chaimarrhornis leucocephala.** White-capped Redstart.

A common and characteristic bird of streams and mountain tarns up to 15,000 ft. two or three birds commonly being seen together.

535. **Rhyacornis fuliginosa.** Plumbeous Redstart.

One bird seen at 8,000 ft. near Malemchigaon.

541. **Grandala coelicolor.** Hodgson's Grandala.

A small party seen at about 15,000 ft. on the way to the Gunja La.

546. **Tarsiger chrysaeus.** Golden Bush Robin.

One of the commonest and most characteristic birds above the tree-line ; it is usually seen about patches of juniper, berberis, or rhododendron scrub, but is frequent in the higher dwarf rhododendron zone. Far from being 'a quiet, retiring little bird' (vide Fauna), I found it bold and conspicuous. As male, female and young have different plumages the bird appears in various guises that are puzzling at first; the tail is the best key to identity.

599. **Oreocincla dixoni.** Long-tailed Mountain Thrush.

An astonishingly tame bird frequented a Bhuddist stone shrine on the ridge about a mile short of Thare Pati at 11,500 ft. It walked about on the ground and allowed one to approach almost within touching distance before flying off a short way. I noted that the primary coverts were tipped with fulvous, which identifies this bird as *dixoni* and not *mollissima* (vide Fauna, 1st edition).

605. **Monticola erythrogastra.** Chestnut-bellied Rock Thrush.

A pair seen at 11,000 ft. just below the shrine mentioned above. The male sat calling for some time on the topmost shoot of a Silver Fir; the white neck patch and black barring on the under-parts of the female were noticeable.

620. **Laiscopus collaris.** Eastern Alpine Hedge-Sparrow.

Seen round our top camp at 15,000 ft. on the way to the Ganja La.

(628. **Prunella rubeculoides.** Robin Hedge-Sparrow.

I thought I saw this bird also at the top camp, but am not sure of the identification.)

(A Bush Warbler or Willow Warbler, dark brown in colour with a pale supercilium, uttering a treble call-note, is common in scrub to 14,000 ft.)

Phylloscopus pulcher. Nepal Orange-barred Willow-Warbler.

Not uncommon in rhododendron scrub at 10,000—12,000 ft.

Phylloscopus sp. One species with greenish upper-parts, a supercilium, and a single wing-bar is very common in the area, and its call-note of two notes repeated half-a-dozen times is commonly heard.

1041. **Perissospiza carneipes.** White-winged Grosbeak.

Several pairs seen round Thare Pati. The Fauna description of it as a noisy restless bird with a rasping call-note is apt.

1047. **Pyrrhula nipalensis.** Brown Bullfinch.

Two pairs seen: one in Sheopuri forest at 7,000 ft., the other along the pilgrim trail at 8,000 ft. A restless bird with an arresting melodious call-note. The general brown colour with purple-black primaries and tail, and dark brown round the eye and bill are diagonistic.

1052. **Propyrrhula subhimachala.** Red-headed Rosefinch.

I twice saw females at 11,000 ft. in rhododendron scrub, but no males.

1053. **Pyrrhospiza punicea.** Red-breasted Rosefinch.

A male seen at 12,000 ft. in rhododendron-juniper scrub by the pilgrim trail.

1055. **Propasser thura.** Nepal White-browed Rosefinch.

Not uncommon in rhododendron-juniper scrub and seen up to 13,500 ft. The white end to the broad pink supercilium is diagnostic in the male.

1059. **Propasser pulcherrimus.** Beautiful Rosefinch.

Also fairly common to 13,000 ft. One noisy party, uttering harsh bleating notes in rhododendron bushes, seemed to consist entirely of males.

1089. **Hypacanthis spinoides.** Himalayan Greenfinch.

The most markedly characteristic bird of the pilgrim trail from Sheopuri to Thare Pati, seen both in open country and in forest clearings. A noisy obtrusive bird with handsome black and yellow plumage; one of its notes is strongly reminiscent of the call-note of the Iora, *weeeeeee-tu*, dropping in pitch at the end.

1142? House Martins, which I identified as *cashmeriensis*, were seen hawking insects at 7,000 ft. over the pilgrim trail.

1186. **Anthus hodgsoni.** Indian Tree Pipit.

Common in parties above the tree line at 12,000—15,000 ft.

1579. **Upupa epops.** Hoopoe.

Pairs seen in open country, usually near tarns or camp sites (especially where short green grass is found), at 12,000—15,000 ft.

1609. **Collocalia brevirostris.** Himalayan Swiftlet.

Parties seen on the wing over the pilgrim trail at 8,000 ft. The rump was noticeably paler than the wings and tail.

1624. **Caprimulgus macrourus.** Nepal Long-tailed Nightjar.

I put up a nightjar, light brown in colour and showing little white on wings or tail, at Thare Pati, 12,000 ft., that I believe to have been a female of this species. It seemed altogether too light for *C. indicus*, which I would have expected at this altitude.

1716. **Gypaëtus barabtus.** Lammergeier.

One bird seen over the pilgrim trail at 7,000 ft.

1858. **Columba leuconota.** White-bellied or Snow Pigeon.

A small flock seen several times round our highest camp at 15,000 ft.

1928. **Lophophorus impejanus.** Monal Pheasant.

Common from 11,000 to 15,000 ft. both along the pilgrim trail and along the track to the Gunja La. Cocks and hens were always separate, usually in parties of 3 to 6 birds. A young female shot had yellow soles to the feet, whereas in the adult they were greenish-brown. In flight the female appears brown with much white on the tail.

1993. **Lerwa lerwa.** Snow Partridge.

Coveys seen at 16,000 ft. on the track to the Ganja La, and at 12,000 ft. above the pilgrim trail. Red bill and legs, chestnut breast, and closely barred black and buff upper-parts are diagnostic; the white bars near the tips of the inner secondaries show up in flight. Birds utter shrill whistles when alarmed.

THE STORM-PETRELS OCCURRING IN THE NORTHERN INDIAN OCEAN, AND ADJACENT SEAS.

By

C. A. Gibson-Hill, M.A., M.B.O.U.

(*Raffles Museum, Singapore*)

(*With a plate*)

Four species of storm petrel have been recorded at different times from the north portion of the Indian Ocean and its adjacent seas.[1] They are,

Wilson's Storm-Petrel, *Oceanites oceanicus* (Kuhl)
Black-bellied Storm-Petrel, *Fregetta tropica* (Gould)
British Storm-Petrel, *Hydrobates pelagicus* (Linn.)
Swinhoe's Storm-Petrel, *Oceanodroma monorhis* (Swinhoe)

The most plentiful and interesting of these is Wilson's Storm-Petrel, which occurs as a regular winter visitor from June to October. The other three would appear to be only very rare vagrants, and in the case of one at least the identification may be erroneous.

In the following notes an attempt is made to summarise what is known of the occurrence of these birds in our area, with the inclusion of some unpublished data. It must be stressed that records are still meagre, and further information, supported if possible by skins, would be welcome. For this reason a brief statement of the essential characteristics of each species, as seen on the wing, has been added at the end of the section dealing with it.

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[1] I have decided, after careful consideration, not to include in this paper the records of W. W. A. Phillips (*Journal B.N.H.S.*, Vol. 46 pt. 4, pp. 593–613).

Oceanites oceanicus (Kuhl): Wilson's Storm-Petrel.

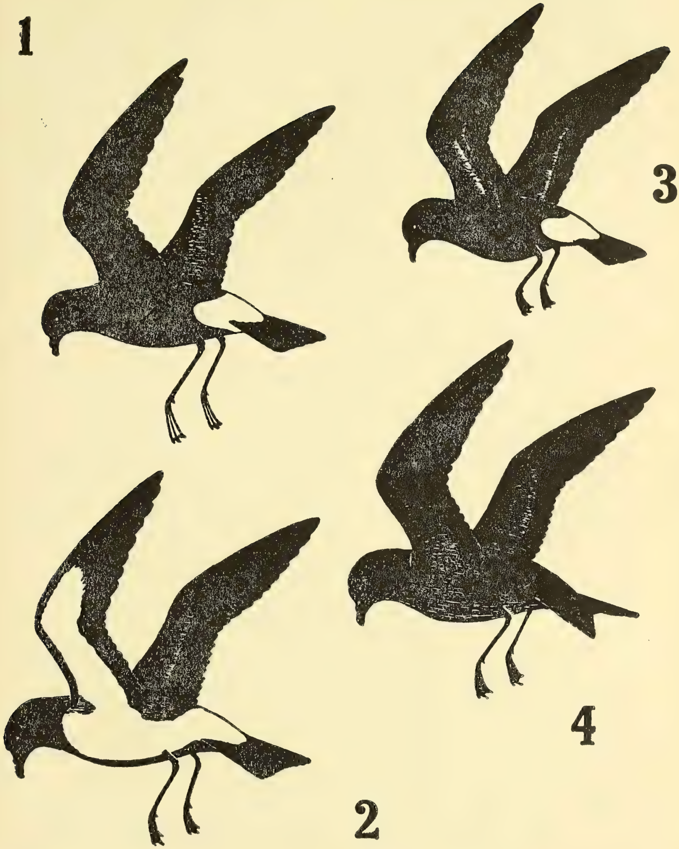
Wilson's Petrel breeds at a number of points on the coast of the Antarctic Continent and the adjacent islands, and on several islands in the Antarctic and Sub-Antarctic zones. In the sector south of the Indian Ocean it is known to nest in Enderby Land, Kaiser William II Land, Queen Mary Land and Kerguelen. It probably also breeds on Heard Island, but the point has not yet been confirmed. A record has been published of its supposed nesting on Mauritius (Bent, 1922, p. 172), but it must be considered erroneous. Birds seen in the Indian Ocean are most likely to be either *O. oceanicus exasperatus* Mathews, from the Antarctic Continent, or *O. oceanicus parvus* Falla, from the Kerguelen group.

Dr. Brian Roberts in a monograph on this petrel quotes all the information accessible to him on its oceanic migrations (Roberts, 1940, pp. 176–187). There are a large number of records from the Atlantic Ocean, from which it would appear that the majority of the adult birds breeding south of this area make a clockwise tour of the region from March to October, extending north as far as the latitude of Newfoundland and the British Isles. They normally reach the vicinity of the former in April, and leave the entrance to the English Channel by the end of September. There is considerably less information available with regard to the Indian and Pacific Oceans.

The data collected by Dr. Roberts for the Indian Ocean suggests that the bird is not present north of about 30° south latitude until after the end of April. More recently in this journal P.I.R. Maclaren has recorded Wilson's Petrel as sparsely distributed from Aden to a point 600 miles eastward about the middle of February, 1945 (Maclaren, 1946, p. 543). I saw a single bird some fifty miles north-east of Socotra in the same month in 1947: I was not in a position to keep a continuous watch, and there may have been more. Both these records are appreciably earlier than Dr. Roberts's data for this latitude. His information would suggest that the birds move northwards in the Indian Ocean rather later than in the Atlantic. These observations raise a different point. Birds seen in February can scarcely have finished breeding for the season, and still reached the Gulf of Aden so early in the year. It would suggest that a proportion of the non-breeding birds remain in this area, north of the equator, throughout the southern summer. This is an interesting possibility, but one would have felt that if it were so, there would have been other records for the period December to April. At present there are none.

There are several records from the southern Indian Ocean for May, but by the end of this month at least some birds are in the Arabian Sea. Captain Butler took a specimen, now in the British Museum, off the Mekran coast, between Charbar and Pusni, on 28th May, 1877, and saw others (Butler, 1877, p. 291). Captain Bishop, who was with him at the time, later met with it off the coast of Sind, between Karachi and the Indus, but unfortunately no date is given to this observation (Butler, 1878, p. 178).

A number of records show that Wilson's Petrel is plentiful in the area comprising the western portion of the Arabian Sea, the Gulf of Aden and the southern half of the Red Sea from June to September,



1. Wilson's Storm-Petrel [*Oceanites oceanicus* (Kuhl)]
2. Black-bellied Storm-Petrel [*Fregetta tropica* (Gould)]
3. British Storm-Petrel [*Hydrobates pelagicus* (Linn.)]
4. Swinhoe's Storm-Petrel [*Oceanodroma monorhis* (Swinhoe)

and apparently absent from the southern half of the Indian Ocean. In addition to the data summarised by Dr. Roberts, Maclaren (*ibid*) reports a few birds within 500 miles of Suez in June 1944, and huge numbers between about 240 and 270 miles east of Aden, and near the Straits of Bab-el-Mandeb, in the same month of 1946. H. G. Lumsden (1947, *in lit.*) saw occasional birds from 600 miles east of Aden to about half way up the Red Sea early in June, 1947. E. H. Bromley (1947, *in lit.*) observed Wilson's Petrels following in the wake of the ship in ones and twos, or up to about half a dozen, during the first part of a journey from Aden to Colombo, on 5th to 8th September, 1931. In 1945 I saw Wilson's Petrels continuously from the vicinity of Socotra to the neighbourhood of the Twelve Apostles, north of Perim, from 29th September to 2nd October. At times over forty were in sight at once. There can be no doubt of the identity of the bird as one landed in a life boat during the early morning of 2nd October, and was captured without difficulty.

According to Dr. Roberts, southward movement begins in October, but some birds still linger in the Arabian Sea until the end of the month. Bromley (*ibid*) saw several Wilson's Petrels in the Gulf of Aden on 9th October, 1946, and one near the entrance to Colombo harbour on 14th October. There are no certain records for the Indian Ocean proper north of latitude 40° south for November, except for a bird captured off Ceylon by Captain Fletcher in 1908 (Wait, 1925, p. 418), and it would seem that the main body of the migration has already passed below 50° south latitude. The Ceylon record is interesting. Various observers since Legge, who saw birds probably of this species on 19th August, 1874 (Legge, 1880, p. 1057), report birds off the Ceylonese coast, often without dates, but the only specimen that has been taken is Captain Fletcher's.

The general conclusion of these records, as Dr. Roberts points out, would be that the principal northerly goal of the migration across the Indian Ocean is in the extreme north-west. Probably the main mass of birds reaches the neighbourhood of Socotra and the Arabian coast in May and June, and moves south by way of the waters off Ceylon in September and November. There remains to be considered the extent to which they can be said to travel further east. There are no records from the northern part of the Bay of Bengal, but there are now several from the neighbourhood of the Malay Peninsula.

Davison saw birds which were probably of this species near the Moscos, off the coast of Tenasserim, north of Tavoy, in July (Hume and Davison, 1878, p. 490)[1]. Robinson and Chasen (1936, p. 87) note that on several occasions small black petrels with white rumps had been seen in stormy weather in various parts of the Straits of Malacca, but they give no details of dates or localities. On 19th September, 1945, I saw a single bird in the neighbourhood of the Aroa Islands (Straits of Malacca, lat. 3° north, long. 100° 40′ east). Bromley (1948) records three or four of these birds seen about midday on 12th December, 1938, while crossing from the Langkawi Islands to the Kedah mainland. On the whole one would suggest that these represent a small proportion of the total mass, rather than the main body of the movement. The Straits of Malacca are relatively narrow, and much frequented by shipping. If any large number of birds were passing down them annually one would expect to find more records. It would seem also that Bromley's birds were rather late for a southward movement towards the breeding grounds. They must either have been strays that were lost or, like the early records from the neighbourhood of the Arabian Sea, birds wintering north of the equator.

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[1] This information is also given in a note by Hume to Butler's paper (Butler, 1877, p. 292).

Several of the earlier observers, particularly Legge (1880, p. 1057), appear to have been unwilling to make positive identifications. Caution in these matters is very desirable, but there would seem to be little doubt that Wilson's Petrel is the only storm petrel with a white rump and dark underparts occurring regularly in the Indian Ocean proper. Identification can be further confirmed by the long legs, with yellow webs to the feet, which trail behind the tail in a conspicuous and characteristic manner in flight. Two of the three recorded rare vagrants, the British Storm-Petrel and the Black-bellied Storm-Petrel, also have white rumps, but their legs are entirely black and appreciably shorter, and they are smaller, with a weaker, more fluttering, bat-like flight. The Black-bellied Storm-Petrel also has prominent white areas on the flanks and sides of the abdomen, and the middle of the under surface of the wings. These points might be difficult to distinguish from the deck of a large ship, but my feeling is that they would not be. I had experience of both birds on a passage by a whale-catcher from Durban via Cape Town to South Georgia, and certainly from that low level there was no doubt of the white on the ventral surface of *Fregetta tropica*.

Fregetta tropica (Gould): Black-bellied Storm-Petrel.

In the southern Indian Ocean this bird breeds on Kerguelen and the Crozet Islands. It may also nest on St. Paul and Amsterdam Islands, but these sites have never been confirmed. The Black-bellied Storm-Petrel is plentiful in parts of the southern oceans, particularly the South Atlantic, but it does not appear to make a regular crossing of the tropical zone. Sperling (1872, p. 75) writes of about thirty of these birds playing round the wake of his ship in latitude 5° south, longitude 30° west, but I know of only one record from the North Atlantic—the type specimen which was taken in latitude 6° 33′ north, off the coast of Sierra Leone.

This species is included in the fauna of the northern Indian Ocean on the strength of a single specimen labelled 'Bay of Bengal' in the Marquis of Tweeddale's handwriting, which was in his collection when it was acquired by the British Museum. Blanford (1898, p. 355) accepts the locality, and since then this region has been included in its range (Stuart Baker, 1929, p. 302). There do not appear to be any reliable sight records from our area.

The interest of this bird here would seem to be largely that it has several times been considered when a white-rumped storm-petrel was seen. The plumage differences are given above, under Wilson's Petrel. In addition I would stress the very weak, fluttering flight, which struck me most forcibly when I watched these birds in the South Atlantic.

Hydrobates pelagicus (Linn.): British Storm-Petrel.

The nearest breeding grounds of this bird are on certain of the islands in the western Mediterranean. Its occurrence within our area, even as a very rare vagrant, is doubtful. Von Heuglin (1873, quoted by Dr. Roberts, 1940, p. 186) records the presence of storm-petrels in the neighbourhood of Bab-el-Mandeb and the Gulf of Tajura, in the Red Sea, in September and October. He did not obtain any specimens, but thought that the birds belonged to this species. In view of the extent to which Wilson's Storm-Petrel is now known to occur in this area during these months, it would seem probable that his identification was erroneous, and that the Red Sea should be excised from the range of this bird until formal evidence is forthcoming.

The British Storm-Petrel, like Wilson's, has a white rump, but it is smaller, with an irregular, whitish patch on the middle of the undersurface of the wings and dark webs to its feet, which do not project beyond the tail in flight. The last two points are diagnostic. It also has more rounded wings and a much weaker, and more fluttering flight, not unlike that of the Black-bellied Storm-Petrel.

Oceanodroma monorhis (Swinhoe): Swinhoe's Storm-Petrel.

This is a Pacific species, with races breeding on both sides of the Ocean. The typical form, *O. m. monorhis* (Swinhoe) nests on islands off Formosa, ranging north to Japan and south to the southern end of the Straits of Malacca.

Swinhoe's Petrel would seem to be not uncommon in the neighbourhood of Horsburgh Lighthouse, 37½ miles east of Singapore, from September to May. The Raffles Museum collection contains specimens taken there in April, May, September, October and November. I visited Pedra Branca on 28th September, 1947. No petrels were seen in the vicinity of the lighthouse, but two, undoubtedly of this species, were observed about ten miles east of Singapore harbour, on the return journey. Robinson and Chasen (1936, p. 86) quote a visual record by C. Boden Kloss of a small flock seen inshore off Singapore Island in November, and a specimen was captured on a ship in the harbour in May, 1913.

This species occasionally travels at least a short distance northwards up the Straits of Malacca, and thus enters our area. There is a specimen in the Raffles Museum collection from the One Fathom Bank Lighthouse, between the Aroa Islands and the coast of Selangor, taken in November, 1918. It is possible that it sometimes strays further west, though there is only a single record, unsupported by a skin. H. M. Tomlinson (1924, p. 51) describes a petrel of a uniform dark chocolate colour which came aboard the ship on which he was travelling, late at night on 10th June 1923, when they were about fourteen hours west of Colombo. It was liberated after he had examined it, but he was of the opinion that he recognized the species immediately when he was shown specimens of Swinhoe's

Petrel on his arrival in Singapore. A bird so far west must, however, be considered to be no more than a very rare vagrant, well away from its normal range. It is significant that all the unidentified petrels recorded from the Indian Ocean are said to have had white rumps.

Swinhoe's Petrel is about the same size as Wilson's, with a similar, rather swallow-like flight, appreciably stronger than that of the two smaller species. It differs in having short, black, legs with black feet, and in appearing a fairly uniform, sooty brown, slightly greyer on the neck and underparts. The dark rump distinguishes it from all other storm-petrels so far recorded from the northern Indian Ocean.

APPENDIX

The following species also include islands to the south of the Indian Ocean within their breeding range, but have not yet been recorded definitely from the northern Indian Ocean.

Pelagodroma marina (Latham): White-faced Storm-Petrel.

A race of this bird, *P. marina dulciae* Mathews, nests on the south-western and southern coasts of Australia: the type locality is Breaksea Island, in south-west Australia. The species is widely distributed as a breeding bird in the southern oceans, but there are few pelagic records. It can be distinguished from all other storm-petrels by its white face and entirely white under surface, including the under wing-coverts. The rump is light grey. The legs are long, and the webs of the feet yellow except at their edges. On these latter points it might be confused with Wilson's Petrel, but the wide area of white on the under parts is distinctive, and, in my experience, that on the face, throat and neck can be seen easily in flight.

Garrodia nereis (Gould): Grey-backed Storm-Petrel.

The breeding range of this bird includes the Kerguelen Islands. There are again very few pelagic records, and it does not appear to stray into the North Atlantic from the nesting grounds south of that area. It is smaller than the White-faced Storm-Petrel, from which it can be distinguished readily by its shorter legs, and dark grey face, neck and chest.

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EFFECT OF WEIRS AT THE CANAL HEAD-WORKS ON THE DISTRIBUTION OF *CATLA CATLA* (HAMILTON), IN THE PUNJAB

BY

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(*with a map*).

I. INTRODUCTION.

Catla catla is a valuable food fish attaining to six feet or more in length, and is an inhabitant of fresh water. It was at one time found in great abundance in the rivers and streams of the plains of the Punjab. Its presence in the hill-streams has never been reported. Unlike *Labeo rohita* (Hamilton) and *Cirrhina mrigala* (Hamilton), *Catla catla* (Hamilton) is now, however, not so widely distributed in the Punjab. Consequently, an investigation into the causes of the rarity of *Catla catla* in the Punjab was undertaken.

II. LOCATION OF WEIRS IN THE PUNJAB RIVERS.

Apart from the Jamuna and the Indus which form respectively the south-eastern and the north-western boundaries of the province, the Punjab is endowed with five big rivers and a network of canals. The five rivers, Sutlej, Beas, Ravi, Chenab and Jhelum take their origin from the hills on the north-east and flow through the plains of the Punjab towards the south-west, falling ultimately into the Indus, beyond the boundary of the Punjab.

The waters of all the above-mentioned rivers except the Beas, are utilized for irrigation purposes by building weirs across the rivers for the canal head-works. The Beas joins river Sutlej at 'Hari-ke-pattan', about thirty miles on the east of Husainiwala (Ferozepore) weir.

Two weirs have been built across river Jhelum, one at Mangla, where the river leaves the hills and enters the plains. The Upper Jhelum Canal takes its origin from Mangla Head-works. The second weir for the Lower Jhelum Canal at Rasul is about eighty miles from Mangla weir. All the water of the Jhelum is diverted into these canals, and the river below the Rasul weir remains dry for the greater part of the year. Except during a few months in the summer (monsoon), the Upper and the Lower Jhelum canals work alternately, as there is not enough water in the river for both the canals during winter.

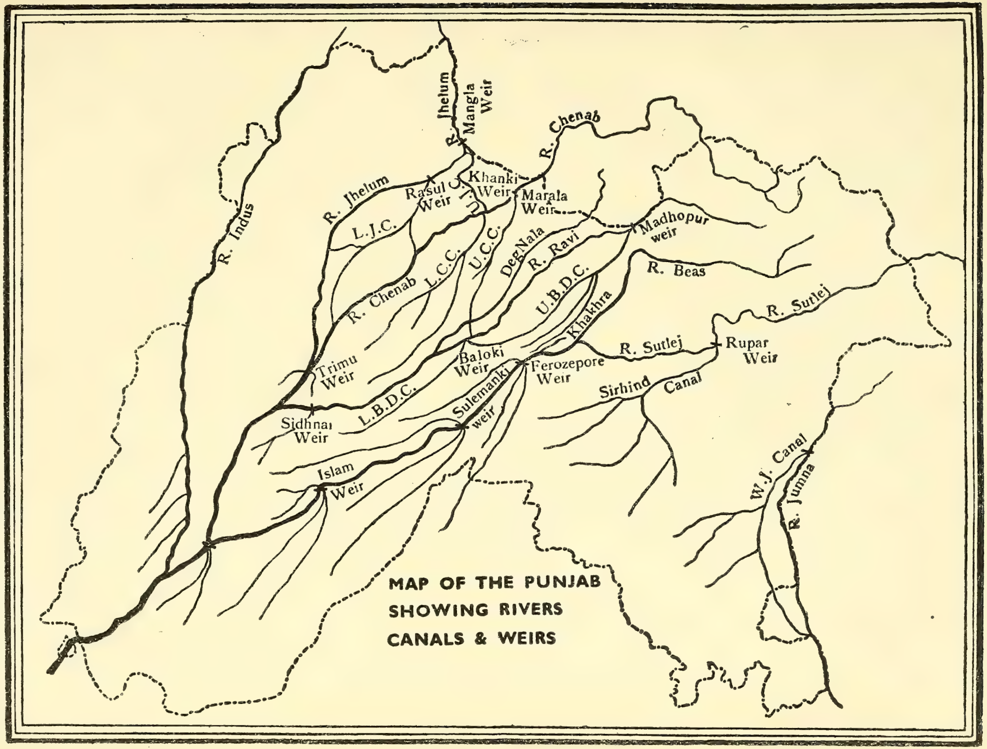
The Chenab has three weirs, one at Marala, the second at Khanki, and the third at Trimu. The Upper Chenab Canal takes its origin from the Marala Head-works, where the Chenab enters the plains. The Lower Chenab Canal takes its origin from Khanki Canal Head-works. The water in the Chenab below the Marala weir is not sufficient for the Lower Chenab Canal during the winter months. It is, therefore, supplemented by the supply from the Upper Jhelum Canal. During winter, no water is allowed to pass into the river below the Khanki weir, and one can easily walk across the river during these months when its bed is either dry or the water is hardly a few inches deep. The author, himself, crossed the river during the month of January, 1929, about forty miles below the Khanki weir, where the water was only ankle-deep. The canal which takes its origin at Trimu weir gets its full supply of water during the period when there is excess of water in rivers Chenab and Jhelum which join a few miles above the Trimu weir. During winter the supply into the canal is hardly sufficient to meet the minimum demands of the people whose lands are irrigated by this water. Not a drop of water is allowed to pass at the Trimu weir into the river during the greater part of the year.

Like Chenab, river Ravi has three weirs, one at Madhopur, second at Balloki, and the third Sidhnai weir near Ram Chontra. From Madhopur to a distance of about hundred miles, river Ravi contains very little water during the winter months. The supply of water is supplemented by the water from the Upper Chenab Canal which is diverted into the Lower Bari Doab Canal at Balloki weir. No water passes below Balloki weir for the greater part of the year. River Ravi, like the Jhelum and the Chenab, remains almost dry for the greater part of the year, and whatever fish is left in the pools which are formed in the beds of these rivers, is caught by the fishermen during the winter months.

The Sutlej enters the plains at Rupar, where the head-works for the Sirhind canal is built. The conditions of the Sutlej below the Rupar weir upto 'Hari-ke-pattan' where the Beas pours its supply of water into the Sutlej, are similar to those of the Ravi before the Upper Chenab Canal falls into it. During winter the water in river Sutlej above the Rupar weir is not sufficient even for the Sirhind Canal. As in river Ravi, the pools in the bed of river Sutlej from Rupar to 'Hari-ke-pattan' are netted by the fishermen, and no fish is left in this tract of the river. Below 'Hari-ke-pattan', river Sutlej gets all the water from the Beas, and the three weirs of the Sutlej Valley Project, Husainiwala (Ferozepore), Suleimanki, and Islam at Palla, divert the water into the canals which take their origin from the above weirs. Below the Islam weir, the river is absolutely dry.

III. Survey of the Waters.

In order to trace the distribution of *Catla catla*, a survey of these waters was conducted. Quite a large number of fishing places along



MAP OF THE PUNJAB
SHOWING RIVERS
CANALS & WEIRS

R. Jhelum
Mangla Weir
R. Chenab
R. Indus
R. Jhelum
Rasul Weir
U.J.C.
Khanki Weir
Marala Weir
L.J.C.
U.C.C.
Deg Nala
R. Ravi
Madhopur weir
R. Beas
L.C.C.
R. Chenab
U.B.D.C.
Khakhra
R. Sutlej
R. Sutlej
Rupar Weir
Baloki Weir
Ferozepore Weir
Trimu Weir
Sirhind Canal
L.B.D.C.
Sulemanki weir
Sidhnai Weir
Islam Weir
W.J. Canal
R. Jumna

the rivers were visited by the author during the course of the last few years. River Jhelum contains mahseer, *Barbus* (*Tor*) *putitora*, to a considerable extent, even during the journey to a great distance in the plains, and *Catla catla* is not reported to exist even upto the Rasul weir. Although river Jhelum is said to enter the plains at Mangla, still we find small hills running parallel to the river even beyond the Rasul weir in Jhelum District.

Catla catla was at one time caught in considerable numbers by the fishermen from river Chenab and Palkhu, its important tributary. But for the past few years, neither adult *Catla* nor its fry have been found in Palkhu and the pools round about it, where it once spawned in large numbers. The deep pools and the important fishing places on Palkhu, which at one time gave shelter to adult *Catla*, have now been silted up.

The big pools formed in the back-waters of river Ravi, were at one time the home of *Catla catla*. But, during the course of the last few years, *Catla catla* seems to have become extinct in river Ravi. In a pool about ten miles from Lahore in river Ravi, several maunds of big adult *Catla catla* alone were netted, some years ago. But *Catla catla* has been caught in very small numbers for the last few years above Balloki weir. The author got certain pools netted below the Sidhnai weir near Katalpur, where a few specimens of *Catla catla* were found. But these pools remain cut off from the main stream due to the paucity of water below this weir. *Catla catla* has not been able to get its hold for the last few years anywhere in river Ravi, due most probably, to scarcity of water in a great stretch of the river between the weirs, and due to lack of opportunity for spawning. Nikki Deg, a tributary of river Ravi, where fry of *Catla catla* was at one time caught in considerable numbers, now remains dry for the greater part of the year. *Catla catla* has not been traced for the last few years along with *Labeo rohita* and *Cirrhina mrigala* fry in the pools where they are stranded during the monsoon floods. *Catla* fry is not found in Sakki, another important tributary of the Ravi in Amritsar District, where fry of *Cirrhina mrigala* and *Labeo rohita* are met with in great abundance.

No weir has been built across river Beas, hence it is always full of water. Big adult *Catla* has been caught in this river throughout its length and breadth. Even above Naushera ferry, which is hardly ten to twelve miles from the place where the Beas enters the plains, *Catla catla* weighing about thirty seers was netted. River Beas merges its identity into the Sutlej at 'Hari-ke-pattan'. The distance from 'Hari-ke-pattan' to Mirthal where river Beas enters the plains, upto which *Catla catla* can survive, is about 120 miles. Abundance of *Catla catla* is found in river Sutlej from 'Hari-ke-pattan' downwards, although very little *Catla* is found in the pools of river Sutlej from 'Hari-ke-pattan' to Rupar. Buddha Nala, a tributary of river Sutlej near Ludhiana, which at one time had not only deep pools but also good fishing places in its bed, has, like Palkhu, been deprived of the deep pools and fishing places where *Catla catla* could take shelter.

There are certain big dhands, above 'Hari-ke-pattan' in Ludhiana and Ferozepore districts, cut off from river Sutlej, where big *Catla* is caught in quite a large number, but they are few and far between.

They, no doubt, serve as sanctuaries for *Catla catla*, but they cannot supplement the supply of *Catla catla* into the river, unless very heavy floods which come after a decade or so, connect these dhands with the rivers. Below 'Hari-ke-pattan', *Catla catla* is found in great abundance in river Sutlej, its tributaries and other pools, dhands and back-waters which are flooded when the river swells before the rains or during the monsoon floods. During the visit of the author to different places along river Sutlej from Islam weir to 'Hari-ke-pattan', there was no place where *Catla catla* was not found in large numbers. There is a big dhand enclosed by the 'bunds' of the head-works, on the right bank of river Sutlej, a little above the Islam weir, which serves as a pocket to store large quantity of water for the use of the head-works authorities. The reservoir contains big pools where *Catla catla* and other big fishes take shelter. The backwaters of river Sutlej at Tibbi Lal Begh and Machhisinghwala in Montgomery District, serve as sanctuaries for the fry of *Catla catla*. The fields lying in between the Sutlej and these dhands serve as spawning grounds for *Catla catla*. At one time the dhands at Machhisinghwala contained large numbers of *Catla catla* and its fry, but they are being filled up.

During the course of the summer months (May and June), large numbers of adult *Catla catla* are seen in the pools just below the weirs at Suleimanki and Husainiwala (Ferozepore), but they are helpless and do not venture to pass through the fish-ladders to come into the lakes formed above the weirs.

Khakhra, a tributary of river Sutlej in Lahore District, has a big dhand containing large number of carp fry. Fry of *Catla catla* formed 60 per cent of the fish-population of this dhand when netting was tried in October, 1944, and it still dominates the fauna of this dhand. Khakhra is a small stream, and this dhand in Khakhra is said to be a part of the old bed of river Beas when rivers Beas and Sutlej flowed parallel for a considerable distance in Lahore and Montgomery districts. The other dhands and pools on either side of river Sutlej below Khakhra also contain quite a large number of fry of *Catla catla*.

IV. DISCUSSION.

From the survey of the waters carried out, it is evident that *Catla catla* is in abundance in the waters of river Sutlej and its tributaries, viz. Beas, Khakhra and other pools below 'Hari-ke-pattan', connected with it during floods. The lakes above Husainiwala (Ferozepore), Suleimanki and Islam weirs serve as sanctuaries for *Catla catla*. The Sutlej, thus, always contains enough of water from 'Hari-ke-pattan' to Islam weir, and *Catla catla* gets an opportunity to reach its spawning grounds in the Sutlej and the Beas above the Ferozepore weir, as the Beas contains enough water throughout the year.

Catla catla and its fry is found in great abundance in the pools which are flooded during July and August above the Husainiwala (Ferozepore) weir. Fry of *Catla catla* has also been found in large numbers in the areas which are flooded above Islam and Suleimanki weirs.

Catla catla, on the other hand, has not been found in appreciable numbers at any place in rivers Ravi and Chenab and their tributaries like Palkhu, Deg and Sakki, where at one time they were found in large numbers.

We are, therefore, led to the conclusion that the weirs at the canal head-works in the Punjab rivers, enumerated above, seem to have interfered seriously with the distribution of fishes in general, and *Catla catla* in particular, due to the following reasons:

1. Most of the water at the weirs, e.g. Rupar, Madhopur, Balloki, Khanki, etc., is diverted into the canals, and large stretches of the rivers below the weirs either remain dry or contain very small amount of water. *Catla catla* is a big fish as compared to other fishes, and requires deeper and larger volume of water for its abode and at the time of its spawning. It, therefore, cannot live in greater stretches of the rivers which contain very little amount of water, except in the pools formed in their beds here and there, from which all the fish is netted out during the winter months.

2. The migration of *Catla catla* is seriously interfered with by the weirs which obstruct its passage from the rivers to the spawning grounds higher up above the weirs. Hamid Khan (1924) mentions that most of the Cyprinidae, such as Rohu (*Labeo rohita*), Morakha (*Cirrhina mrigala*), Theila (*Catla catla*), as well as some Siluroids, namely, Bachwa (*Pseudeutropius garua*), Khagga (*Rita rita*) and others, ascend the rivers during the monsoon rains in search of suitable spawning grounds. Hamid Khan (1940) says that for the propagation of all game and food fishes of the Punjab, proper facilities are needed to enable them to ascend the rivers so as to reach such waters as will suit them to lay their spawn. He has further stated that with the development of irrigation projects in the Punjab, dams or weirs have been constructed in the form of masonry works at the head-works of the canals for the purpose of deflecting water into the canals. The weirs run across the entire width of the river obstructing both the upward and the downward passage of fish.

3. Day (1873) recommended that every irrigation weir spanning a river should have a practicable fish-pass in it. Dunsford (1911) drew the attention of the Punjab Government to the erection of fish-passes and suggested certain principles for guidance. But although fish-ladders have been constructed across the weirs at the canal head-works, yet *Catla catla* does not seem to pass the weirs through the fish-ladders, due most probably to certain defects in the working of the fish-ladders. Bayer (1908) says that the underlying principle in the construction of fish-ways is the retardation of the current velocity of a waterfall so as to enable fish to surmount it.

4. In most cases the pools at the bottom of the fish-ladders, where the fish would naturally collect before ascending the river, are either too small and are full of silt and other accumulations and deposits, or are not connected with the main current of the river below the weir. According to Dunsford (1911), the pass (fish-ladder) must be situated where it will be self-advertising, i.e. it must form a current impinging into a certain place below the obstacle so strongly that it becomes the chief or predominant current of the stream, where the fish will be led to that point for attempting the ascent.

5. Due to its timid and shy nature *Catla catla* does not seem to make use of the defective fish-ladders constructed across the weirs.

6. The fish, especially *Catla catla*, which enters the canals at the

canal head-works, is considered lost. In the absence of any fish passages from the canals into the rivers, *Catla catla* cannot come back into the rivers in most cases due to the strong current and steep falls of water into the canals at their origin.

In other countries, e.g. U.S.A., great care has been taken to facilitate the migration of fish and to reduce the harmful effects of the weirs on their productivity. But although fish-passages have been constructed in the weirs at the canal head-works in the Punjab, yet they either do not work properly and remain out of use, or they are not built suitably and are not wide enough to allow big varieties of fish, like *Catla catla*, to pass up and down the river.

V. SUMMARY.

The Punjab, as its name signifies, has five big rivers which irrigate the parched soil of the province. There are twelve weirs in four out of the five rivers, the Beas being an exception, from where eighteen canals take their origin. The weirs at the canal head-works divert, in almost all the cases, most of the water from the rivers into the canals. Due to the weirs built at different places, large stretches of the river-beds remain dry or contain very little water during the major part of the year.

Catla catla, which is a fresh-water fish and grows to a big size, was at one time found throughout the plains of the Punjab. Due to its build and size, it needs deeper water for its abode and spawning. Its movements before and during the spawning season are interfered with by the weirs built at the canal head-works. The fish-ladders, which have been built as passages for the fish to cross the weirs, are not suitably built, and do not work properly. *Catla catla* does not seem to make use of the fish-ladders, due perhaps to its size and its shy and timid nature. The fish which enters the canals along with the water of the rivers at the weirs, is considered lost, there being no passages from the canals to the rivers, as the fish cannot go back into the rivers due to the absence of fish-passages at the heads of the canals.

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INCIDENCE OF FISH MORTALITY ON THE WEST COAST[1]

BY

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'Widespread fish-mortality is a well-known phenomenon on the Malabar and South Kanara coasts; its recurrence yearly along certain stretches of the coast line is regular, though its intensity varies within wide limits' (Hornell, 1917). This unusual incidence of mortality has been attributed to the suffocative influence of certain forms of Marine Euglenoids that suddenly burst in particular regions. Since the initial report of Mr. Hornell on this subject was published in 1917, no attention was paid to this problem, although its importance is self-evident.

A detailed investigation by us in 1944 and 1946 has thrown some more light on this subject. The present communication serves to add further to Mr. Hornell's observations (1917).

There is a regular uniformity in the incidence of fish mortality on the West Coast, since the phenomenon usually occurs during the North-East monsoon. On the 3rd of November 1944, a large number of *Sillage sihamma*, *Gobius* spp., *Caranx* spp., *Ambassis dayi*, prawns and *Pristipom* spp., were seen struggling for life in the water near the shore regions off Calicut. *Ambassis* was found to be much affected. The fishermen of the locality made a big haul of these fishes struggling in the initial stages of death. As the day aged on, the phenomenon continued with greater intensity and shoals of these fishes died, decayed and were washed ashore in heaps, emitting a foul odour all around. The water in which the casualty occurred was muddy, and it was thought that the movement of mud banks had caused this wholesale death in the inshore regions. Mr. C. F. Sims, Port Officer, Calicut, in a communication to the Biological Station, wrote on this question of mud banks: 'The mud bank appears to extend from the shore to nearly four cables seawards all along the coast. The absence of the usual shore waves and swells over this particular area, indicates the presence of the mud deposit there, below the still waters. It is perhaps due to under currents shifting mud from the bed of the open sea towards the shore, or from subterranean rivers of mud forced to the surface, through the sea bed, due to the action of the sea. This silt is generally oily and alien to the sea sand and is not conducive to fish life. The formation of this mud bank usually occurs during the North-East monsoon.' No more information could perhaps be obtained at that time.

The incident recurred next year, although not near the inshore regions but far out in the open sea. Mr. Sidney Schofield, Master of S.S. *Wing Sang*, in a communication to the Station, wrote that some 10 miles off Cochin beyond Lat. 10°27′ N., Long. 76° East, the ship ran into a shoal of dead tunny 'all handsome, fresh and healthy specimens', obviously only recently dead perhaps within the previous two or three hours. The mortality extended to 10 miles. Each carcass was separated by .0°27′ or 150 yards from its neighbour and on the assumption that they covered a circle of 10 miles in diameter, Mr. Schofield calculated their number to be between 20,000 and 40,000. The ship is said to have steamed through this area for an hour at 12½ knots speed. Eight days later and about 48 miles south of this area of catastrophe, Mr. Schofield again witnessed some hundreds of dead fish along a tide-rip. The head, guts and gills were all missing, but the fresh barbs of the dorsal fins still remained and manifested the fact that they were all tunny, all except a very large one at some considerable distance away which was probably a shark. Many birds were leisurely feeding on them and the smaller fish under the surface were having a good time. Presumably the fish seen that day were remnants of those witnessed by Mr. Schofield eight days earlier and carried southwards by a current. The Port Officer, Cochin, writing on this incident commented that every year masses of dead fish float in the harbour area, producing a stench. 'These float in on the flood tide. The cause has always been attributed to the presence of mud banks along this coast which when stirred up, probably as a result of the South-West monsoon, give off gas or liquid, which poisons the fish over a period of two or three days annually in August.' The cause was now also attributed to mud banks.

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[1] Published with the kind permission of the Director of Industries and Commerce, Madras.

Hornell (1917) also observed a series of similar incidents. There have been of course, differences and fluctuations in the periods of occurrence, sites in which casualty took place, and the species affected. But certain inferences can be drawn from these observations which may be summarised as follows:—

(1) That the casualty is caused by localisation of poisonous water called *Kedunir* and *Karanir* (Shore water). (*Sennir* (Red water) that Hornell has clubbed with this is not poisonous and is caused by Noctiluca swarms.)

(2) That this phenomenon occurs soon after the South-West monsoon, or just after the outbreak of North-East monsoon—more commonly the latter.

(3) The phenomenon lasts for a short period only, since perhaps the effect of *Kedunir* and *Karanir* is soon counteracted by the flowing in of good water.

The popular beliefs and English versions of this incidence of piscine mortality have been dealt with in detail by Hornell (1917). The phenomenon recurred twice in the course of the last year.

The first incident occurred in and around a rock (*Pambankallu*), half a mile to the west of Pudiappa shore in the sea and two miles to the north of West Hill Biological Station. On the 20th of September 1946, the staff of the Biological Station in the course of collecting spat of *Mytilus edulis*, fell upon a big haul of a variety of fish in different stages of asphyxiation, coma and death. The species affected were *Plotosus arab*, *Serranus pantherinus*, *Palinurus* spp., *Scylla serrata*, *Neptunus* spp., *Plagusia marmorata* and *Cynoglossus brevirostris*. Big specimens of *Plagusia*, *Cynoglossus* and *Plotosus arab* were swimming in a state of coma, struggling hard for their life, evidently due to lack of oxygen; 'many keeping their mouths above water were collected by mere hand'. As soon as the incident was reported to us, we repaired to the place immediately. But unfortunately, by this time the phenomenon had been eclipsed by the flowing in of fresh sea water, and so we could collect no more data. The gills of the dead fish were red and blood-shot. The stomachs were empty in all cases.

On the 31st of October 1946, a similar incident occurred near West Hill Biological Station. Heaps of fish were washed ashore by the mild swells of the sea, and many more were found floating dead in the mild breakers very near the shore. The incident was noticed in the afternoon. The fish were in a high state of putrefaction and the whole region stank in a nauseating manner. Evidently the creatures had died some 10 or 12 hours before, at some other place. This was confirmed by local enquiries; fishermen told us that the incident had occurred just past midnight on the 30th, about a mile away from us. When we noticed the incident, there was a very slight drift to the south and the water had begun to flow in. The area affected was about two miles long and about half a mile wide.

The water in which the fish were found floating was brownish, resembling hay decoction in colour. The following physical conditions were noted:—

Time.	*Surf. Temp.*	*Sp. gravity.*	*pH.*
3 p.m.	33·5°C.	1020·0	9·2
4 p.m.	33·1°C.	1020·3	9·1
5 p.m.	32·4°C.	1020·6	9·0
6 p.m.	31·6°C.	1020·8	8·8

The oxygen content of the water at 3 p.m. was 3/100000, and at 6 p.m. 6/100000. There was a slow but moderately big current flowing from north to south, and it was evidently carrying fresh sea water into this area. The phenomenon passed off at about twilight. The catalogue of the species affected, which is a long one, consisted of the following:—

Anodontostoma chacunda (Buch. and Ham.).
Otolithes ruber (Schn.).
Johnius carutta (Bloch).
Sillago sihama (Forskal).
Cynoglossus semifasciatus (Day).
Cynoglossus spp. (specific characters beyond recognition),

Muraena spp. (beyond recognition).
Rastrelliger kanagurta. (Rupp.) (one specimen).
Therapon jarbua (Forskal).
Caranx melamphygus Cuv. and Val.
Etroplus suratensis (Bloch). (one specimen).
Loligo spp.
Emgraulis spp.
Ambassis dayi.
Arius spp.
Plotosus spp.

The presence of *Etroplus suratensis*, a brackish-water form, in this list is interesting. The only plausible explanation is, that this incident occurred first, perhaps, in the early hours of the 31st, at the mouth of one of the various brackish-water canals that enjoin the sea a few miles to the north of the West Hill Station.

The plankton collected from this area and centrifuged showed myriads of Euglenoids which were brownish-yellow with plenty of chloroplasts. The flagellum which Hornell (1917) described was not visible; nor could we find the red eye-spot. However, the rapid peculiar settling of these organisms to the bottom of the water to form a 'semi-quiescent' light-yellowish jelly was witnessed by us also.

This flagellate was described in detail by Hornell and Naidu (1924) who observed also the existence of the jelly-like matrix with many of these organisms embedded in it in the sea bottom of the West Coast. 'The range of this organism seawards is great. It appears to assume its motile stage only so long as the water is in gentle agitation. In calm weather this is quite quiescent ready to throw off new swarms of the motile form when the proper excitation occurs' (Hornell and Naidu).

The outbreak of the monsoon is usually attended by an abundant supply of nutrient materials in the inshore waters of West Coast. The rough seas prevailing at this time of the year render observation of the phenomenon difficult. With the gradual return to normal weather, the sea becomes calm. Currents begin to change and the mud banks to shift. This movement of mud-banks induces the slight agitation required to throw off the motile forms of the Euglenoid from the gelatinous matrix. The first indication of the movement of the mud-banks is the throwing ashore of a large number of Cavernularia and Hippa. This agitation of mud casts up a lot of oily material and causes a mild, but efficient, mixing of the different strata of water. 'The sun after the heavy rains becomes a power in the Malabar sky'. The Euglenoids thrown off by the gelatinous matrix are immersed in a medium surcharged with all the necessary nutrient material for their development and multiplication. Photo synthesis occurs and results in the production of myriads of active and motile Euglenoids. They use up the oxygen in the water medium at night, when the water is almost completely deoxygenated. Simultaneously, the mud suspension settles. Rapid decay of the multitudinous Euglenoids sets in creating and producing 'nauseous and evil smelling' decomposition products. The death of all living forms in the area is thus effected by two causes; asphyxiation due to lack of oxygen and toxic effects of dead and decaying Euglenoids.

The course of events leading up to the mortality of fish may be summarised as follows :—

1. With the change in current very soon after the monsoons, the mud-banks begin to move and this gives the required agitation for the throwing off of the quiescent Euglenoids from the jelly-like matrix at the bottom.
2. Fine sunlight and sufficient nutrient materials in the sea water end in a sudden outburst of these Euglenoids, which at night use up almost all the oxygen in the surrounding medium, thereby causing asphyxiation to the fishes in the locality.
3. With the settling of the mud in the area, the sea becomes calm, and with the powerful sunlight acting on it, causes a rapid decay of the dead organisms, thus creating deleterious and toxic effects to the piscine fauna.
4. Good sea water flowing into the region restores normal conditions.

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THE EARLY STAGES OF INDIAN LEPIDOPTERA

BY

D. G. SEVASTOPULO, F.R.E.S.

PART XX

(*Continued from Vol.* 47 p. 219)

RHOPALOCERA

PAPILIONIDAE

Papilio polytes L., *romulus* Cr.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xlvi, 575. 1947.

A rare form of pupa, which I have only seen formed in captivity, is green, the wing cases lightly mottled with fawn and with a darker green, triangular, central mark. The keel on the mesothorax filled in with fawn, and with the subdorsal triangular mark on the anterior portion of the abdomen fawn instead of the usual yellow-green. The subdorsal tubercles and a ring round the spiracles fawn. The cephalic horns, the sides of the thorax and the abdomen mottled lightly with fawn.

Described from a pupa bred in Calcutta in November 1946.

Zetides doson Fldr., *eleius* Fruhs.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xliv, 415. 1944.

Ovum—Very pale green, spherical, the base flattened. Fairly large. Laid singly on the underside of a young leaf of the foodplant.

1st instar—Head dark olive brown. Body jet black, the anal somite whitish. A double subdorsal and a lateral series of short tubercles from 2nd to 12th somite bearing long, forked, black bristles, 2nd and 3rd somites with an additional dorsal pair. 1st somite with a subdorsal, 2nd and 3rd somites with an additional tubercle between the subdorsal and lateral series, anal somite with an outspread pair of whitish dorsal tubercles, all the preceding rather larger than the others and armed with medium length bristles. The thoracic somites swollen, the body tapering towards the rear.

2nd instar—Similar, but only the large tubercles on the thoracic and anal somites present. Colour bronzy, clad with very short black pubescence, giving a velvety appearance.

Described from a larva bred from ova found in Calcutta in June 1946.

PIERIDAE

Cepora (*Huphina*) *nerissa* F., *phryne* F. (*evagete* Cr.)

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xl, 394. 1938.

Talbot, *Fauna Brit. Ind.*, Butterflies, i (2nd edit.), 363, pl. 2, figs. 7, 8. 1939.

My above quoted description was a comparative one for publication in a London magazine. The following is a more complete description.

Ovum—Typical Pierid shape, the upper end terminating in a ring of teeth, sides longitudinally ribbed. Colour white when first laid, later becoming orange. Laid singly on a leaf or shoot of the food-plant, above or below.

Young larva—Head brownish green. Body yellowish green, rather oily-looking. Under a lens clothed with brownish pubescence.

Full grown larva—Head and body rich leaf green, densely sprinkled with minute white points, those on the body placed in transverse lines, and clad with short white pubescence. A fringe of slightly longer whitish far sublaterally. Venter greenish white with a green median stripe. Legs and prolegs greenish white.

Pupa typically Pierid in shape, the cephalic snout rugose and slightly down-curved, the thorax keeled, 3rd abdominal somite expanded laterally and ending in a spine above the wing case. Suspended by a girdle and tail pad of white silk. Colour usually bluish green, but may be yellower green or, rarely, brownish, the wing cases and venter paler. The cephalic snout, a dorsal patch on the pro-thorax, the thoracic keel, a subdorsal patch on the 2nd and the whole of the dorsal area of the 3rd abdominal somite to the tip of the spine pale buff. The spine itself and the extreme edge of the thoracic keel black. Traces of a buff dorsal line on the abdomen and a yellow lateral line. A subdorsal series of black specks.

Described from a full fed larva found in Calcutta 11. vi. 46, pupated 13. vi. 46 and a male emerged 22. vi. 46.

Talbot, quoting Bell, states that the head in the first two instars is black. I did not observe this.

Anapheis aurota F., *aurota* (*Belenois mesentina* Cr.)

Moore, *Cat. Lep. Mus. E. I. Co.*, i, 72, pl. 12, figs. 9, 9a. 1857.

Bell, Aitken and Davidson, *Journ., Bomb. Nat. Hist. Soc.*, x, 575. 1897.

Moore, *Lep. Ind.*, vi, 158, pl. 527, fig. 1. 1904.

Bingham, *Fauna Brit. Ind.*, Butterflies, ii, 157. 1907.

Bell, *Journ., Bomb. Nat. Hist. Soc.*, xxi, 1153. 1912.

Talbot, *Fauna Brit. Ind.*, Butterflies, i (2nd edit.), 381, pl. 2, figs. 5, 6. 1939.

Ovum—Of typical Pierid shape, upright, longitudinally ribbed, the top surrounded by a ring of teeth. Laid in fairly large batches. Colour almost white when first laid, later becoming a pale creamy yellow.

1st instar—Head black. Body oily, yellowish-green. Clothed with forked, colourless hairs.

Full grown larva—Head black dotted with yellow, each dot emitting a white bristle, the clypeus filled in with greenish and outlined by a broad, green, inverted V. Body with a broad, shiny, yellow-green, dorsal stripe with the central portion rather bluer green, a grey-black lateral stripe and a yellow green sublateral. 1st somite with a yellow dorsal collar. 2nd and 3rd somites with four raised yellow points dorsally, 4th to 11th somites with an anterior inner and a posterior outer pair of raised yellow points. The lateral stripe, which encroaches slightly onto the dorsal area on the 12th somite and which joins on the 13th leaving a small V-shaped yellow-green dorsal spot, minutely yellow-speckled and with a median series of raised yellow points. A sublateral series of raised yellow points. Anal plate black. Venter, legs and prolegs yellow green, the legs and prolegs with black shanks. The dorsum of the 1st somite anteriorly and the sublateral area clothed with short white hairs, the rest of the body pubescent,

In the 2nd and 3rd instars the head is black and the larvae are gregarious. The yellow speckling of the head and the V mark develop in the 4th instar, when the larvae scatter.

Typical Pierid pupa in shape, head produced into a short central point, thorax slightly keeled, 3rd abdominal somite with a large spine over the edge of the wing case. Suspended by a girdle and tail pad of white silk. Colour pale whitish-, greenish-, or pinkish-grey, the cephalic snout, the posterior slope of the thoracic keel and the abdominal spine outlined with black. The thorax streaked and spotted with blackish, abdominal somites with two dorsal and a subdorsal series of minute black specks. Thoracic somites each with six, abdominal with four, raised yellow spots. A whitish lateral line, below which the abdomen is paler. Wing cases paler, streaked along the inner margin with blackish and with short blackish streaks along the veins starting from black specks on the outer margin.

Food-plant—*Capparis horrida.*

Described from larvae bred from ova found in Calcutta, one of which pupated 20. v. 46 and a male emerged 25. v. 46.

The pupa is described as being dimorphic, a green form being produced among leaves. Talbot's figure shews a green pupa with yellow spots, although the text states that the green form has them black.

I found the larvae very delicate in the pre-pupational stage, many of them bleeding profusely and dying after they had hung up.

GRYPOCERA

CELAENORRHINAE

Tagiades japetus Cr. (*atticus* Swinh. *nec* F.), *khasiana* Moore.

Ovum—Pale crimson. Almost spherical, the base flattened. Under a lens with a few, slightly raised ribs running from micropyle to base, and covered with pale buff hairs, presumably from the anal tuft of the female. Laid singly on the upperside of a leaf of the food-plant.

Newly hatched larva—Head large, honey-coloured, slightly indented above. Body dull green, with a broad dorso-lateral crimson stripe.

Half grown larva—Head black, heart-shaped, fairly large. Body greenish yellow with a dorso-lateral crimson stripe.

Full grown larva—Head dark mahogany, broadly heart-shaped, rather large. Body greyish green, minutely speckled with white, a dark, pulsating, dorsal stripe. Legs and prolegs pale grey-green. Anal flap flat and rounded, yellowish. 1st somite constricted forming a neck.

The young larva lives in a cell formed of a roughly circular piece cut from the edge of the leaf, turned over and secured by a few silken threads. The circular piece is not entirely severed, a small attachment being left. The habit is lost in older larvae, at any rate in captivity.

Pupa between two spun-together leaves, and supported by a girdle and tail pad. Unangled, head truncate, square, with a short, central, forward-pointing, tuberculate process. General ground colour pale bone, minutely speckled with brown so that there is a pale brown appearance. Head and pro-thorax suffused with brown, a diffused brown stripe on the meso-thorax and with the thoracic sutures brown. Paired blackish dorsal spots on the 2nd, 6th and 7th abdominal somites, which may be obsolescent. Underside of the head with a chalky-white diamond containing a dark brown M. Wing cases with two, roughly diamond-shaped chalky-white blotches, the anterior small, the posterior larger. The 3rd abdominal somite with a triangular, chalky-white, lateral mark just above the wing case. An interrupted subdorsal brown stripe on the abdominal somites, indistinctly edged below with chalky-white. 6th to 8th abdominal somites with indistinct chalky-white lateral patches. Two lateral black spots on the 4th abdominal somite against the wing case. 4th to 6th abdominal somites with a sublateral series of brown streaks. Cremaster down-curved. The chalky-white markings composed of an external waxy powder.

Described from larvae bred from ova found in Calcutta, one of which pupated 13. xi. 46 and a male emerged 22. xi. 46.

HETEROCERA

LYMANTRIIDAE

Perina nuda F.

Sevastopulo, *Journ.*, *Bomb. Nat. Hist. Soc.*, xl, 405. 1938.

Ovum—Spherical, flattened above, the micropylar area depressed. Colour reddish purple, a silvery ring round the micropylar area. Laid in small, neat, regular batches. Laid 31. x. 46. Hatched 6. xi. 46.

1st instar—Head chestnut. Body yellowish, 4th and 5th somites with the dorsum black, 7th to 10th with a double dorsal grey stripe, which joins on the 10th somite. 1st somite with subdorsal tubercles. Clothed with long, plumose, colourless hairs.

2nd instar—Head black. Body grey, the 1st, 4th and 5th somites black dorsally. A subdorsal black stripe on the 2nd and 3rd and on the 7th to 10th somites, where it is joined by a black transverse bar. Subdorsal tubercles on the 1st somite and a transverse band on the 11th orange. Clad with long, grey, simple hairs.

3rd instar—Similar but generally darker. The tubercles on the 1st somite black and the orange on the 11th reduced and more crimson.

4th instar—Body blackish, the dorsal area of the 2nd and 3rd somites blue-grey, a white dorsal line on the 7th to 9th somites. Otherwise similar to previous instar.

5th instar—Similar.

6th (penultimate) instar—Similar to preceding, but the head dark brownish grey. The subdorsal area on the 7th to 9th somites with the hair-bearing warts ringed with blue.

Described from larvae bred from ova obtained from a female caught in Calcutta.

SPHINGIDAE

Deilephila nerii L.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xliv, 420. 1944.

Re-reading Bell and Scott's description of the larva of this species (*Fauna Brit. Ind.*, Moths, v, 270. 1937), I have noticed an error. The 3rd instar larva is said to have the horn particoloured, the basal half green, the apical half thin and translucent, the two parts separated by a black ring, whilst the 4th instar larva is described as being similar in all respects to the full grown one. This is incorrect, it is the 4th instar larva that has the horn particoloured, the horn of the 3rd instar larva being black with the extreme base yellow and of normal shape.

NOCTUIDAE

Leucania irregularis Wlk.

Ovum—Very pale yellow with slight opalescen reflections. Almost spherical, the base flattened, but usually flattened above as well through the pressure of the grass blade within which it is laid. Laid in small batches in a folded blade of grass and covered with a transparent cement. Unsculptured. Laid 22. xi. 46. Hatched 28. xi. 46.

1st instar—Head dark honey colour. Body grey, turning green after feeding. A few short colourless hairs. Moves as a semi-looper.

2nd instar—Head dark honey colour. Body brown, turning green after feeding, with eight longitudinal purple lines.

3rd instar—Similar to preceding.

4th instar—Head pale brown, a darker line on each side of the clypeus. Body with the dorsum olive green with a pale dorsal line and two more indistinct pale lines on either side, the olive green area bounded by a pale subdorsal line. Below the subdorsal line there is a brownish-green line, its edges darker, and bordered below by another pale line, below which is a narrow purple-brown lateral line edged below in turn by a pale line, a yellow-green line and a pale line.

5th instar—Head pale brown, a darker line from outside the clypeus to the vertex. Body green, the colour and pattern formed by minute dots on a pale ground. A double dark green dorsal line, a narrow dark green subdorsal stripe with an indistinct dark line between it and the dorsal line. A white line below the subdorsal line, followed by a pale olive stripe with darker edges, a very narrow white line and a dark green stripe with a pale central line. A white spiracular line, below which is a brown stripe and a second white line. Venter, legs and prolegs pale green.

Final instar—Head pale brown with a darker honeycomb pattern laterally and a dark line outlining the clypeus and median suture. Body with the dorsal area blackish, a white median line and a white subdorsal line with a black line immediately above it. Below the subdorsal line, a narrow olive stripe with a rufous centre, below which is a narrow blackish stripe, very narrowly edged above and below with whitish, followed by a rufous stripe edged below with whitish. The sublateral area and venter greenish grey. Legs and prolegs greenish grey, the latter with an external blackish shield-shaped mark. The above is a description of the newly moulted larva, as the instar progresses the colours become paler and duller.

Pupa subterranean in a slight earthen cocoon. Pale chestnut brown, the intersegmental areas darker. The anterior edge of the 4th to 7th abdominal somites with a transverse dentate dorsal ridge. Cremaster a divergent double spine.

Food-plant—Grasses.

Described from larvae bred from ova laid by a female caught in Calcutta, one of which pupated 21. xii. 46 and a male emerged 7-i-47.

Corgatha zonalis Wlk.

Head dark grey, round and very small. Body mottled dark grey, some examples with zig-zag transverse stripes of paler grey. Transversely wrinkled, the skin very rough. First two pairs of abdominal prolegs obsolete. The larva normally walks with a looping motion, but when alarmed it moves sideways with a peculiar jerking gait. It rests stretched out in chinks of bark, and is very difficult to detect.

Cocoon of greyish silk covered with minute fragments of lichen. Slipper-shaped, one end much more pointed than the other, and the blunt (front) end attached to a short silken pedicel. Pupa slender, pale olive, the thorax and base of the wing cases deeper green. The free segments of the abdomen with the intersegmental areas dark brown. Cremaster a twin point without any hooked spines.

Food-plant—A grey lichen growing on the trunks of Palm trees.

Described from a full fed larva found in Calcutta 1. vii. 45, spun 3. vii. 45 and a male emerged 12. vii. 45.

Beara dichromella Wlk.

Sevastopulo, *Journ., Bomb. Nat. Hist. Soc.*, xlii. 289. 1941.

Another form has the head orange brown. The body yellowish-olive. Thoracic somites with the dorsal area greyish and with large subdorsal black spots on the 2nd and 3rd somites. 4th somite with a transverse, chalky white bar. 5th somite orange brown dorsally with two orange brown dorsal tubercles. 6th to 10th somites with a broad, chalk-white, dorsal stripe. 11th somite orange brown dorsally, with a transverse white band posteriorly, slightly humped and with two dorsal tubercles and a black lateral speck. 12th and 13th somites tinged with orange. Clad with single, medium length, whitish hairs arising from white specks, the subdorsal ones, and also the lateral one on the 5th somite, black-ringed. Spiracles black. Venter, legs and prolegs pale green.

Described from a full fed larva found in Calcutta 29. ix. 46, spun 1. x. 46 and a male emerged 7. x. 46.

Ercheia diversipennis Wlk.

Forsaythe, *Trans. Ent. Soc. Lond.*, 412. 1884.
Hampson, *Cat. Lep. Phal.*, xii, 487. 1913.
Gaede, *Seitz Indo-Austr. Noctuidae*, xi, 477. 1938.

Ovum—Almost spherical, with numerous beaded ribs from micropyle to base. When first laid deep greenish-blue, afterwards becoming heavily blotched with purple-brown, finally ending up all purplish-brown with two whitish C-shaped marks joined by a curved line at top and bottom. In captivity, laid singly on blades of grass. Laid 6. xii. 46. Hatched 12. xii. 46.

Newly hatched larva—Grey, long and slender, the first two pairs of prolegs absent. Under a lens clothed with sparse black hairs. Rests erect like a Geometer and moves with a looping motion.

Food-plant—Forsayeth gives Grass, but my larvae refused it and died without feeding.

Described from material obtained in Calcutta.

Hampson, quoting Forsayeth, gives the following description:—'Pale grey, ventral surface deep pink. Cocoon in a doubled-up leaf with a piece of grass attached.' Seitz' description is almost the same except that the venter is said to be dark red.

Achaea serva F.

Head dark reddish brown, the clypeus filled in with pale brown and outlined by a pale brown stripe, a yellow spot on either side of the vertex. Body with the ground colour pale grey, plentifully sprinkled with minute specks that compose the markings. These consist of a purple-brown dorsal stripe, expanding in the middle of each somite, a darker brown subdorsal stripe, the specks on the edge of which are still darker, a purple-brown lateral stripe and a darker brown sublateral stripe, all these stripes with the outline very irregular. 11th somite slightly humped and with two orange red dorsal tubercles, a transverse black line just behind them, which continues obliquely to the lateral area. 12th somite with two blackish dorsal dots. Spiracles orange brown. Legs pink. Abdominal prolegs greyish with a yellowish shield-shaped mark edged with black externally, the first pair obsolescent. Anal claspers very long, grey speckled with purple brown. Venter almost without speckling a dark brown spot between each pair of legs, a larger spot on the 6th somite between the prolegs, on the 7th somite with the spot between the prolegs pinkish-purple, shading into brown anteriorly, a pinkish-purple spot between the prolegs on the 8th and 9th somites, a median brown spot on the 10th somite and a median streak on the 11th.

Pupa in a slight cocoon between two leaves. Pale chestnut brown in colour, but so thickly powdered with bloom that it appears very pale lilac, except on the intersegmental areas. Extreme tip of the abdomen almost black, not covered with bloom, and longitudinally wrinkled. Armed with a few short stout hooked spines, the central pair longer and entangled in the silk of the cocoon.

Described from a full fed larva found in Calcutta 6. vi. 46, pupated 8. vi. 46 and a female emerged 18. vi. 46.

Mocis (*Remigia*) *frugalis* F.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xliii, 45. 1942.

Ovum—Darkish green when freshly laid, afterwards blotched with dull purple. Almost spherical, under a lens with numerous ribs from micropyle to base. Laid singly on blades of grass. Laid 28.x.46. Hatched 1.xi.46.

1st instar—Very long and slender; at first brown, becoming green after feeding, the head pale brown. Very like a Geometer, both in its resting attitude and mode of progress.

2nd instar—Greenish with a subdorsal, lateral and sublateral purple line, the subdorsal line slightly broader and continued onto the head.

3rd instar—Similar but the ground colour between the purple lines whitish. Traces of the black intersegmental colouring between the 4th-5th and 5th-6th somites.

4th instar—Very similar to the adult.

Described from larvae bred from ova obtained from a female caught in Calcutta.

Ophideres fullonica L.

Sevastopulo, *Journ. Bomb. Nat. Hist. Soc.*, xlii, 290. 1941.

Ovum—Yellowish-green, translucent. Dome-shaped. Under a lens the chlorion dull. Laid singly on the under-side of a leaf of the food-plant.

1st instar—Head yellow brown. Body rather oily green, 1st somite with a brown dorsal plate. 4th to 7th and 11th somites with transverse brownish bands laterally. Under a lens with fairly large black specks emitting short black bristles. Legs and prolegs black, first pair of the latter obsolete. Resting position gripping with the abdominal prolegs, the rear part of the body held erect, the fore part also erect and curved, the true legs not gripping, the whole forming a rather flattened S.

A larva found in the 3rd instar had the head olive brown. The body olive green with a darker dorsal line. Ocelli on the 5th and 6th somites with the pupil dark olive green instead of black. The blotches in which the spiracles are set dull plum-colour, the spiracles themselves orange-brown rimmed with black, the whole ringed with olive-green. Legs olive brown, the terminal joint black. Other markings as in the usual black form, but lacking the maroon subdorsal stripe. Assumed the normal black colour in the final instar, but still slightly bronzy, and still lacked the maroon subdorsal stripes.

Another larva found in the final instar had the head olive brown. The body pale green, speckled laterally with white, the dorsal area of the abdominal somites glaucous. The blue dots very pale. Ocelli on the 5th and 6th somites consisting of a very pale bluish green pupil, with a pale blue spot in the lower quarter, rimmed with black, round which is a black-edged white ring, in the anterior ocellus this is wide in the anterior half and narrow posteriorly, in the posterior ocellus only the upper anterior quarter is wide, and that not so wide as in the anterior ocellus, the rest narrow. Spiracles terra-cotta, not set in terra-cotta blotches. No maroon subdorsal stripes. A bluish white line running from above the proleg on the 9th somite obliquely upward to the subdorsal area of the 10th. Legs honey colour, the terminal joint black. Prolegs and venter pale green, the latter with a darker median line.

Described from material found in Calcutta in July 1946.

Libisosa (*Simplicia*) *robustalis* Guen.

Ovum—Bun-shaped, almost transparent pale grey. About twenty-four hours after being laid, they develop a few, irregular, criss-cross, purple-brown streaks. Under a lens unsculptured. Laid singly. Laid 10.v.46. Hatched 13.v.46.

1st instar—Very long and thin, a semi-looper. When first hatched almost transparent greyish pink, after feeding very pale green, but still almost transparent. Under a lens with transverse series of minute black specks emitting fine black bristles, 1st and 2nd pairs of prolegs obsolete.

2nd instar—Head pale honey colour. Body pinkish grey, fairly transparent and taking its general colour from the contents of the intestines. Under a lens with minute black specks. Slightly stouter proportionately than previously. 1st and 2nd pairs of prolegs rudimentary.

3rd instar—Head pale brown. Body dull green, minutely reticulated with purple-brown. Traces of a purple-brown dorsal, subdorsal and lateral line. The intersegmental areas tinged with brownish. A brown dorsal plate on the 1st somite.

4th instar—Very similar. To the naked eye it appears a dull dark grey. The head purple brown minutely speckled with yellowish.

5th instar—Similar.

6th instar—Similar. The dorsal line prominent, the subdorsal and lateral lines almost obliterated by the reticulations.

7th instar—Similar.

Food-plant—The larvae refused *Dalbergia sissoo*, both fresh and dead, but nibbled *Cassia fistula* and appeared to prefer a species of *Amarantus*. The food-plant was evidently unsuitable, as the larvae grew very slowly and appeared stunted, all dying by the 7th instar.

Described from larvae obtained from ova laid by a female caught in Calcutta.

Maxwell-Lefroy (*Indian Insect Life*) describes this as a brown larva feeding on the fallen, dead, dry leaves of *Dalbergia sissoo* ?

GEOMETRIDAE

Comibaena cassidara Guen.

Hamps., *Ill. Het.*, ix, 145, pl. 176, fig. 18a.18, 1893.
Hamps., *Fauna Brit. Ind.*, Moths, iii, 488. 1895.
Prout, *Seitz Indo-Austr. Geometridae*, xii, 92. 1933.

Ovum—Broadly ovoid, flattened above and below. Colour pale straw yellow, with a white line outlining an oval patch on the upper surface. Under a lens minutely punctate. Laid singly or in threes and fours. Laid 24. xii. 46. Hatched 31. xii. 46.

1st instar—Head pale chestnut. Body greyish, with a subdorsal series of stout black bristles, to which the larva immediately on hatching attaches particles of leaf. Shape rather short and stout.

2nd instar—Pale buff, the subdorsal bristles replaced by short fleshy processes, to which the scraps of leaf are attached. Process on the 8th somite lateral rather than subdorsal.

Adult larva—Head brown, an indistinct pale stripe on either side of the clypeus, small. Body of varying shades of brown, some distinctly tinged with yellow or orange, others with olive. A dark dorsal stripe, interrupted intersegmentally and broader at the anterior margin of each somite, and a short subdorsal streak originating from the intersegmental area, which is darker. A dark undulate ventro-lateral stripe. Thoracic somites each with a fleshy subdorsal scolus and a pair of minute, raised, dorsal points. 4th to 7th somites each with a fleshy subdorsal scolus and two lateral, the lateral pair smaller than the subdorsal and the anterior lateral one slightly larger than the posterior. 8th somite with the subdorsal scolus minute, the lateral pair larger. 9th somite backwards with small sublateral scoli, 12th somite with a subdorsal scolus. All the scoli terminating in a stout bristle. Spiracles large, dark brown. Resting attitude with the head and thoracic somites curled under the body. The larva attaches fairly large pieces of leaf and stick to the scoli with short strands of silk.

Pupa in a domed net, covered with the pieces of leaf previously worn by the larva. Colour reddish brown, speckled with dark brown, some examples very much darker than others. The sides of the thorax suffused with dark brown, a dark brown dorsal, subdorsal and ventro-lateral stripe on the abdominal somites. Wing cases streaked with dark brown and covered with pale granules. Antenna cases with a brown streak. Spiracles black. Head and pro-thorax truncate. Tip of the abdomen armed with hooked spines.

Food-plant—*Ziziphus jujuba*, *Lagerstroemia indica*, *Ixora* spp.

Described from larvae bred from ova obtained from a Calcutta-caught female, one of which pupated 22. i. 47 and a male emerged 31. i. 47.

Hampson's description is 'Uniform yellowish-drab. The sides of each somite are produced into fleshy processes, upon which the larva fastens small pieces of withered leaves and sticks as a disguise. It rests with the anterior somites doubled underneath its body.' The larva figured has the fleshy processes rather larger than mine. Seitz merely records the food-plants.

Ptochophyle togata F.

Sevastopulo, *Journ.*, *Bomb. Nat. Hist. Soc.*, xlvi, 67. 1946.

Ovum—Cylindrical, the ends rounded. When first laid bright yellow, later a deep scarlet suffusion develops at the ends and centre and gradually spreads over almost the whole of the surface. Laid, 3. x. 46. Hatched 6. x. 46.

Newly hatched larva—Very pale straw colour with a dark purple dorsal and ventral line.

Full grown larva—Head pale yellowish green, tinged with pink, bifid above and outlined with deep pink. Body dull pale green, slightly tinged with pinkish. 6th somite with a purple, heart-shaped, dorsal spot anteriorly, a sublateral blackish-brown tubercle and a V-shaped mark composed of five blackish-brown spots ventrally. Legs purplish-pink. Prolegs pale yellowish green. Venter rather yellower green and more deeply tinged with pink. Under a lens with very minute black specks. Shape long and slender. Resting position with the body extended and slightly arched. As the instar advances the degree of pink suffusion lessens. Apart from the absence of the tooth on the anal claspers, the larva greatly resembles a *Thalassodes.*

Food-plant—*Eugenia jambolana.*

Described from larvae bred from ova obtained from a Calcutta-caught female.

PYRALIDAE

Macalla carbonifera Meyr.

Head bright lemon yellow, minutely blotched with pale orange. Body yellow-green. A pale mauve dorsal line and subdorsal stripe, the latter edged below by a dark violet line, followed by a whitish line, a broader violet line and a narrow greenish-yellow stripe. The greenish-yellow stripe edged below with dark violet on the 1st and 2nd somites. Spiracles white rimmed with dark brown. A few longish single colourless hairs arising from minute black specks. Venter, legs and prolegs yellow green. The colours are brighter immediately after ecdysis, becoming paler and duller as the instar progresses. Becomes suffused with brownish-purple before pupation. The larva lives in a web of white silk.

Pupa in a cocoon of parchment-like brown silk spun in a folded leaf. Dark mahogany, the thorax and anterior abdominal somites still darker dorsally. Wing cases slightly olive-tinged. Head square in front. Cremaster a bunch of fine spines.

Described from a full fed larva found in Calcutta 5. v. 46, spun 8. v. 46 and a male emerged 19. v. 46.

Syngamia floridalis Zell.

Head whitish with a black lateral stripe. Body green, the colour due almost entirely to the contents of the intestines, and very much paler below the spiracular line. 1st somite with a green dorsal plate, the sides thereof black. 2nd and 3rd somites with a black subdorsal spot, two black lateral spots and a blackish streak between the subdorsal and lateral spots. Abdominal somites with a subdorsal, lateral and sublateral black spot, the sublateral spot smallest. A pulsating dark dorsal line and a very fine, white, spiracular line. Legs honey colour. Prolegs and anal claspers almost colourless. A few colourless hairs. Lives in a silk-lined fold of a leaf.

Pupa in a slight cocoon of white silk in a turned-over leaf. Pale yellowish chestnut, the intersegmental lines on the abdomen darker. Cremaster a stout spike, slightly knobbed at the end and terminating in a few hooked spines. Pro-thoracic spiracle rather large and black.

Food—plant-Urticaceae sp.

Described from a full fed larva found in Calcutta 2. xi. 46, pupated 6. xi. 46 and a male emerged 14. xi. 46.

Glyphodes canthusalis Wlk.

Ovum—Scale-like ovals, laid in small batches. Colour yellowish green, tinged with grey. Laid 14. x. 46. Hatched 19. x. 46.

Newly hatched larva—Pale green, the head black.

Half grown larva—Head black. Body green, the colour due mainly to the contents of the intestines. A black dorsal plate on the 1st somite, 2nd and 3rd somites with a lateral and subdorsal block dot. The spiracle on the 11th somite set in a black dot. 12th somite, anal flap and claspers blackish. A few colourless hairs. Legs black.

Full grown larva—Head large, pale buff, the clypeus and lateral area suffused with fuscous. Body itself almost colourless,but appearing green due to the contents of the intestines, the thoracic somites tinged with amber. A dark green, pulsating, dorsal line. First somite with a pale brown dorsal plate, fuscous at the sides. Spiracle on the 11th somite large and black. 12th somite with a transverse series of four black dots. Legs pale amber. Prolegs and anal claspers almost colourless, glassy. A few colourless hairs. Spiracles, except that on the 11th somite, white. Segmental divisions rather deeply cut laterally.

The larva lives in a web of fine white silk between two leaves.

Pupa in a slight cocoon in a turned-over leaf. Very pale, translucent, grey-green, the abdominal somites, except for a dorsal stripe marbled with yellowish-chestnut, darker laterally. A double brown line on the thorax, the thoracic sutures all outlined with brown. Wing cases outlined with brown, and with a brown line running from the base to the inner margin just above the tornus. Antenna sheaths brown, faint brown lines along the sutures of the leg, antenna and proboscis sheaths. Abdominal somites with a very fine median and posterior transverse brown line. Head with two small forward-pointing tubercles. Antenna and leg sheaths extending to the 6th abdominal somite. Cremaster a stout brown spike, ending in a cluster of hooked spines. Spiracles white, slightly raised.

Food-plant—*Ficus religiosa.*

Described from larvae bred from ova obtained from a Calcutta caught female, one of which pupated 5. xi. 46 and a female, emerged 11. xi. 46.

THE BUTTERFLIES OF THE ANDAMANS AND NICOBARS

BY

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(*Indian Army, retired list.*)

(*With five plates*)

These notes were nearing completion when War broke out in 1939 and they were put to one side. With the return of opportunity in the winter of 1945–46, I was able to complete the rearrangement of my collection, which is now the property of the British Museum and also to write up the *Lycaenidae* and *Hesperiidae* and thus finish my task.

No general paper on the butterflies of the Andamans and Nicobars has appeared since the series of papers published by Woodmason and de Nicéville in various issues of the *Journal of the Asiatic Society of Bengal* for the years 1880–82. The number of forms described therein is 133. The present paper deals with 268 forms and is based on a collection of 3,000 set and 1,000 unset specimens, the result of eight years collecting while I was Chief Commissioner of the Islands during the years 1923 to 1931. Three months before I left Port Blair on retirement I had the great good fortune to receive a visit from Brigadier W. H. Evans, who worked several of the localities in the Great and Little Andaman and also accompanied me on a trip round the Nicobars. As a result of work in the field and of examination of my collection Brigadier Evans was able to name one new species and 22 new races and to restore the names of a few races which had latterly been sunk and to include this new information in the second edition of his Identification of Indian Butterflies, then in preparation for the press. Though progress has been made, much remains for other collectors in these islands to achieve, especially among the *Hesperiidae,* which through a foolish prejudice I neglected until my last year in Port Blair. Again certain areas remain completely or partially unworked, among the former Narkondam, Barren Island, the Brothers, the Sisters and in the Nicobars, Bompoka; among the latter, the Cocos, North Sentinel, the Little Andaman and, in the Nicobars, Tillanchong. No attempt was made by me to study the food plants or the life history of purely local forms, but the unusual length of my stay in the Islands was of material help in determining the comparative rarity of different butterflies and in deciding whether some should not be regarded as occasional migrants or even storm-driven refugees.

The Andamans and Nicobars lie on a curve between Cape Negrais in Burma and the west end of Sumatra. The Great Andaman may be considered as one large island though actually divided by narrow tidal creeks into five parts, the North, Middle and South Andamans, Baratang and Rutland. This mass is 170 miles long and has an average width of 15 miles. Round it lie numerous small islands of which only the Cocos, 20 miles to the north and North Sentinel, 25 miles to the west are sufficiently far away to merit special attention from the butterfly collector. The Gt. Andaman is deeply indented by bays and creeks and is almost everywhere hilly. The highest point, Saddle Peak, 2,400 ft., is in the North Andaman, elsewhere ranges or isolated peaks rise to 1,000 or 1,500 ft. Except where cleared by man or where a rare extrusion of serpentine rock on the summit of Saddle Peak or in Rutland or the Cinque Islands forbids tree growth, the entire land surface is covered with tropical forest and open spaces are only to be met with along the banks of a few streams, as in the Betapur, Bomlungta and Rongat valleys of the Middle Andaman or the Social River running through the Karen village We Bi. The forests start with mangrove, then cane brakes and evergreen forest on alluvial land, then on the lower and more gentle slopes are found deciduous species, then on steeper slopes more evergreens occur with finally ringalls and scrub jungle clothing a few of the highest summits. Round Port Blair there are some 20,000 acres of cleared land comprising ricefields, coconut and other plantations and grazing land, mixed with scattered patches of secondary jungle crossed at the foot of the bigger hills by nullahs with small perennial streams holding the patches of moist sand dear to tropical butterflies and their collectors. Rain to an average total of 150 inches may be expected throughout the months May to December. During the *dhup kala* or sunny season of January to April the streams dry up and the land where cleared turns to iron, though sufficient humidity remains inside the forest to make forest fires unknown. This short and incomplete dry period prevents most of the seasonal dimorphism common on the Indian continent. Dimorphism occurs mainly among prairie forms such as *Melanitis ismene*, *Mycalesis visala*, *Precis almana*, *Hypolimnas bolina*, *Eurema hecabe* and the two *Ceporas* and to a less extent *Ixias pyrene*, *Euploea andamanensis*, *Neptis hylas* and *Neptis jumba* in the Andamans. It is absent in the Nicobars.

Narkondam and Barren Island lie some 60 miles to the east of the Gt. Andaman. The former with its unique hornbill may also possess some unique butterfly. Barren Island now well wooded was barren indeed when seen by Blair in 1788(?) but nevertheless deserves a visit from an entomologist.

A channel of 30 miles width separates the Great from the Little Andaman, a low flat island 350 square miles in extent. Several landings at Bumila Creek in the north and Hut Bay on the east produced numerous specimens of a very distinct local race of *Euploea andamanensis* and three pairs of a lovely grey blue race of *Parthenos sylvia* and a more prolonged search might produce other exciting finds.

The stream flowing into the S. end of Hut Bay should be worked. Extensive air photographs of the Little Andaman are now in existence and will considerably aid any ground exploration of the island. Between Little Andaman and Car Nicobar lies the Ten Degree Channel, 75 miles wide. The Nicobar Islands are scattered and form three groups. Car Nicobar, area 50 square miles, lies isolated in the North. 45 miles to the southward begins the Central Group which includes Kamorta, Nankauri, Trinkat and Kachal fairly close to one another with Teressa, Bompoka, Chaura and Tillanchong a little further away. These total some 250 to 300 square miles, After 30 miles of open sea we come to the Southern Group, Pulo Milo, L. Nicobar, Kondul and Gt. Nicobar. This group somewhat resembles the Gt. Andaman in physical features and vegetation but the mountains are grander and more abrupt, and the forest is more tropical, and the streams are real rivers.

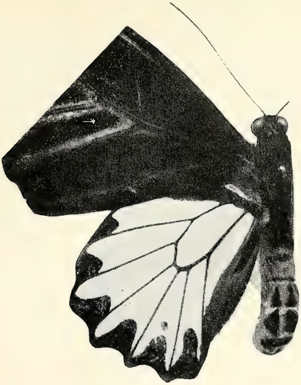
The dangerous reefs surrounding this group make landing often impossible even on the lee side, and proximity to the Equator brings almost daily rain. Many of my visits have been unhappy failures as far as butterflies were concerned owing to rough weather. To the forbidding Gt. Nicobar with its barrier of surf, its deserted shores and gloomy cloud capped mountains, Car Nicobar offers the greatest contrast. It is a vast coconut plantation with occasional patches of light jungle, swamp or *lalang* grass. A comparatively dense population of 150 to the square mile lives happily without causing undue disturbance to plant life and the flora remains sufficiently varied to produce plenty of butterflies of numerous species. The Central Nicobars range from the high forest of Kachal to the bare *lalang* downs of Kamorta. Generally speaking wherever there is a little flat land behind the beach there is a rough plantation of coconut, pandanus and lesser fruit trees through which the collector can wander in search of some small stream descending from the hills that form the background. Such a stream exists at Kondul and the collector should make straight for its upper pools as soon as he sets foot ashore. A much larger and better stream I only found in my last year. It descends from Mt. Thuillier to the deserted bay of Laful on the east of Gt. Nicobar. Its valley is full of good things. Often the newcomer lands to find the shore is merely a narrow sandbank with impassable mangrove swamp behind. This was particularly the case on the Little Andaman. The result was disappointment and wasted effort so far as butterfly collecting went, though the extensive air survey of the Little Andaman made during the war will no doubt lessen the difficulties of the explorer in the future. Time is scheduled and programmes must be kept, so the collector has had to return to the ship to hope for better luck or a more seasonable landing hour at the next anchorage. All these islands should of course be worked by collectors as Boden Kloss worked them, in a privately owned craft. Butterfly collecting and a Government steamer programme are necessarily a bad fit.

The fauna of the Andamans is held to be more closely allied to that of Burma than of India, while the fauna of the Nicobars has some affinities with that of Malaya. The butterflies follow these general lines, but with many vagaries of distribution for which one cannot account. Why are certain common species found in the islands while others equally common are absent although their food plant is available? Many large genera have no representative. Of the six species of *Precis* three occur in both groups. Why not any of the other three? Of the very large genus *Amblypodia* not one form occurs in the Nicobars and only one commonly in the Andamans. On the other hand some genera are in great strength, e.g. *Appias*, *Eurema* (*Terias*) and *Euploea*. Among *Lycaenidae* there are no less than 17 forms of *Nacaduba* and 10 of *Jamides*. Then again several butterflies extremely common in India are extremely rare in the Andamans but do occur regularly, such are *D. chrysippus*, *L. boeticus* and *Appias olferna.* Again the Gt. Andaman had been industriously worked by Wimberley, de Roepstorff, Woodmason and others, 50 years and more ago and by several collectors since, but it was not till 1927 that the conspicuous *Yoma sabrina vasuki* was observed. In that year it was extremely numerous for several months in the Middle and South Andamans and must have bred there for it was repeatedly taken quite fresh. Since then it has not been seen. During my first four years I saw and took only one *Appias albina darada.* In 1927 this species was to be taken by the hundred. During the next four years I never saw it. Some seven or eight of the species recorded in this paper are almost certainly stragglers and indeed some of the individuals among them were captured after heavy gales. Some forms have only been taken in areas which are inexplicably small. *Heliophorus epicles* is common at Bomlungta in December and January but has been seen nowhere else. It is identical in appearance with the same species occurring in far off Kumaon. *Artipe eryx*, a rare form, also occurs only at Bomlungta. It is impossible to understand why these two butterflies are not found throughout the Gt. Andaman. *Jamides kankena pseudelpis* and *Eurema andersoni andamana* fly in great numbers at Bomlungta in December. They are extremely rare in the S. Andaman. One interesting Malayan form, *Hypolimnas antilope anomala* is found only in one small locality on Car Nicobar, the furthest of the Nicobars from Malaya. *Danaus affinis malayana* has been taken only in one small locality in the Central Nicobars where there are considerable areas suitable for it. Some of the insects recorded by previous collectors were never seen by me in eight years. Of these *Byasa sambilanga* is not in the British museum. *Neptis jumba binghami*, *N. ebusa* and *Artipe eryx* I never saw, nor the females of *N. nar* and *Doleschallia celinde continentalis.* The female of *Appias panda chrysea* evaded me for 95 out of the 96 months I was in the Islands. During my last month I took three. A female specimen of *E. schreiberi tisamenus* was brought me as a sort of visiting card by Bhagwan Din my local collector, when I first engaged him in 1923. It was damaged. I kept the wings of the right side. In the next seven and a half years neither he nor I caught or saw another.

The study of the local sub-species and their territorial limits has proved very interesting. It has been said above that for some unascertained reason certain species in the Gt. Andaman are very severely localized. In spite of this there is no instance of any species in this homogeneous area developing different races. For this argument I include with the Gt. Andaman all those appurtenances known as the Ritchie Archipelago, the Labyrinth Islands and the Cinques, each of these islands lying within six miles of some other or of the main Andaman. But when the sea barrier increases to 25 miles it is enough to produce in a few instances very marked races. Thus *Euploea andamanensis* has an undoubted and most distinct race in the Little Andaman and another not so distinct but none the less constant race in the North Sentinel. These two islands are respectively 30 and 25 miles distant from the Gt. Andaman. Again in the Little Andaman *Parthenos sylvia* is not moss-green as in Port Blair but a lovely powder blue. Both these islands have for various good reasons been very imperfectly worked and more races should be forthcoming. I am inclined to think that one or two local races may occur in the Cocos Islands and there may also be more seasonal dimorphism there. I paid a one day visit to the Gt. Cocos in October 1930 and took or observed some 40 forms all normal. The *Pieridae* seemed specially numerous. Novelties may reasonably be expected from Narcondam and possibly Barren Island. In the Nicobars the greater distances and depths of water between islands have led to pronounced localization. Many species are found only in one island or one group, while other species common to several islands have developed as many as three races each. Previous writers such as Bingham were content to label an insect "Andamans" or "Nicobars", without further detail. Consequently Colonel Bingham in the belief that branded and unbranded males of *Euploea scherzeri* were to be found flying together in the same locality treated them as one race whereas in fact unbranded males are only found in the Southern Nicobars and belong without doubt to a constant and well defined race—*simulatrix*, so named by Woodmason and de Nicéville.

A little should be said about hunting seasons and hunting grounds in the Gt. Andaman. July and August are very poor months with often not a single butterfly on the wing. By December things have brightened up and several *Lycaenidae* have their only or at least their larger brood then. Bomlungta should without fail receive attention during December. For the rest March to early June is, as elsewhere, the great catching time. All the lesser used roads well away from the cleared settlement should be worked, especially those to Rangachang, Maimyo, and between Austinabad and Birchganj. Where these roads cross streams much may be done. At Mt. Harriet in April a walk round the flowering hedges near the bungalows once an hour will each time produce a few good Lycaenidae. The walk to Black Rock has its own special *Nymphalidae* and the paths from that walk down to Wimberleyganj should be worked. Hill tops other than Mt. Harriet I found disappointing, neither Saddle Peak nor Mt. Ford produced anything. A collector should be sent occasionally to a forest extraction camp with orders to watch elephant droppings and sap from newly felled trees. *Kallima* are attracted by a whiskey and soda or a glass of claret at a picnic. To conclude this introduction it should be said that care is necessary to avoid damage from the prevailing damp of the region. Papered specimens should be dried out before being put away. Store boxes need watching for psocids. I avoided general damp by an electric light bulb in the cabinet. Set butterflies are apt to spring, this is specially the case with the *Euploeas*. I must not conclude without expressing my cordial thanks to Dr. Corbett and his staff at the British Museum for their kindness and courtesy, and to Brigadier Evans for his unstinted help and advice.

Note.—The paper is accompanied by five uncoloured plates designed mainly to exemplify the constancy of local races, especially among the *Euploeas*. Coloured plates would bring out the differences more clearly. Several other species exhibiting distinct



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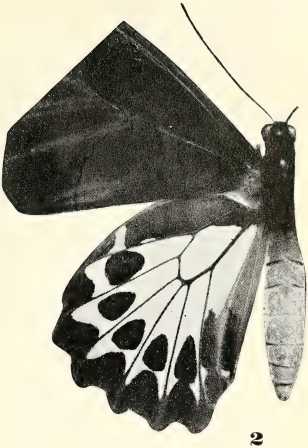

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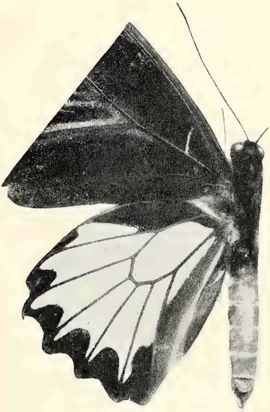

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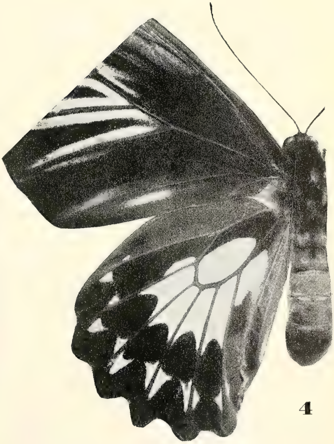

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(1) Troides helena heliconoides M. ♂
(2) ,, ,, ,, ,, ♀
(3) ,, ,, ferrari Tyt. ♂
(4) ,, ,, ,, ,, ♀

localized races have been omitted, such as *Neptis hylas* and *Curetis saronis*, each with three races.

(The order and nomenclature in the following list is that of Evans's Indian Butterflies, second edition.)

A. PAPILIONIDAE

A1. TROIDES.

*1 (δ) *helena heliconoides* ♂ and ♀ v. *aphnea* Jord. and Andaman. N. R. March to May and September. Flies high most of the day near the broad leafed *Sterculia villosa* but may be taken early and late near the ground. Good places are the roads to Rangachang and Maimyo and the path to Black Rock on Mt. Harriet.

* (η) *helena ferrari* Tyt. Gt. & L. Nicobar and Kondul. Females typically with whitish stripes upf. It is strange that this well-marked race was never recorded by de Roepstorff, Man and other entomologists in the nineteenth century and was first taken at Kondul in 1926. There are only eight specimens in collections. On landing at the usual beach at Kondul the collector should turn left along the shore for three hundred yards, over a small rocky promontory and on reaching a small stream just beyond turn right handed and he should soon see one, possibly two *ferrari* high above his head. He will be lucky to get one and luckier still if that is a male. At perhaps my fifth visit to Kondul I took two males. The little valley of four or five acres extent watered by this stream contains many interesting blues and skippers especially at the very top. In the course of a dozen landings and explorations of the G. and L. Nicobars I only saw two other individual *ferrari*.

A2. TROS.

6. (γ). *coon sambilanga* Doh. I searched the B. M. and Tring and Calcutta museums and found only one at the last named. It bore a Gt. Nicobar label. In spite of a diligent look out I never saw one in the Southern Nicobars.

7. *rhodifer* But. Gt. Andaman, N. R. female much scarcer than male. Good series in B. M. and Calcutta. Flies slowly along jungle paths in contrast to the female of *mayo*, its mimic.

9. *hector*, L. A pair were taken by McMillan, very fresh, on 24-6-22, possibly blown to Pt. Blair from Madras. V. R.

* 10. (γ) *aristolochiae goniopeltis* Roth.—Gt. Andaman especially Pt. Blair, a prairie flier and very common. Seasonal dimorphism mentioned by Bingham not apparent.

* (δ) *aristolochiae sawi* Ev.—Car Nicobar, very common, especially at Sawi Bay, the N. E. monsoon landing place. The race is constant for Car Nicobar.

* (4) *aristolochiae camorta*. Very common on Camorta and Nankauri but not found on Kachal only some half dozen miles across the sea.

* (3) *aristolochiae kondulana* Ev. Another constant race, N. R. Taken on Kondul and probably to be found on the rest of the Southern group. In amplification of Evans's description I should say that the ends of the post cellular white spots uph are not convex, and clearly defined as in *goniopeltis* and *sawi* but concave and obscured by a sprinkling of black scales.

A3. CHILASA.

5. (δ) *clytia flavolimbatus* Ob. ♂ N.R ♀ much scarcer than ♀ March to May in Gt. Andaman males on flowers or sand.

A4. PAPILIO.

2. *memnon agenor* L.—R. Two males and two females taken in S. Nicobars where the butterfly is frequently seen on the open banks of the Galathea and other big rivers in company with *Danaus nesippus*. Difficult to obtain. The female mimics *Tros coon sambilanga*. One male straggler taken on Car Nicobar and one female on Ross Island, Port Blair. The latter was typically *alcanor* in form and both stragglers were probably blown over from Tenasserim. The two

females from Gt. Nicobar have the white markings uph much reduced and the body almost black in contrast to the yellow body with black stripe of *alcanor*. 3. *mayo*, Atk. Gt. and L. Andaman, males N. R. females scarce but should be got in December. Best locality is the Black Rock path, Mt. Harriet, but any road through jungle has a few males hurrying up and down it. The females on the other hand only leave the jungle on one side to dart across the road and be lost in the jungle on the far side. A mimic of *Tros rhodifer*. Possibly a sub-species of *memnon*.

23. *fuscus andamanicus* Roth. Gt. Andaman, rather local. The best place is the Rongat stream East of Bomlungta in the M. Andaman. Males N. R. females scarce. March and April.

25. β *polytes stichioides* Ev. Common in open places in the South Andaman. The two forms of female in equal numbers.

γ *polytes nikobarus* Fd. Common on Car Nicobar and Camorta, and taken on Kachal. Females of *polytes* form at Camorta, as one might expect, incline to mimic *Tros camorta*.

A5. PATHYSA.

6. δ *antiphates epaminondas* Ob.—Males common locally in Andamans, females less so. Found with *fuscus* at sand and on flowers. A rapid flier through dense jungle, yet I have never taken a specimen with damaged tails.

A6. ZETIDES.

5. β *eurypylus macronius* Jord. R. taken locally with *fuscus* at sand.

8. γ *agammemnon andamanicus* Lathy. Gt. Andaman, N. R. males fond of flowers in the open. More often seen than caught—a remark which applies to many butterflies.

δ *agamemnon decoratus* Roth. Very common in Car Nicobar, less so in Central Nicobars.

η *agammemnon pulo* Ev. S. Nicobars. Not common and in fact only taken by me after several visits on which I had never seen it. The race has been separated on three males and one female but seems a good one.

B. PIERIDAE

B 1. LEPTOSIA Hub.

α *nina nina* F. N.C. Extremely local in Port Blair, in fact in the 100 square miles of settlement my collector and I took it only in the neighbourhood of Tusonabad and Cadellganj, to the west of the harbour. Not on the wing for long in the year; my specimens all taken in June except for one in December when there is presumably another brood. No seasonal difference apparent. Mr. Field with four years' experience only took it at Tusonabad and calls it rare.

β *nina nicobarica* Doh. N. R. very local in the Southern Nicobars. My specimens were all taken in March with the exception of one ♀ in September.

B8. BELENOIS Hub.

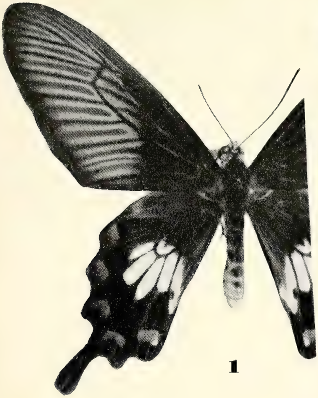
β *mesentina mesentina* Cr. Bingham reports that a dsf specimen was taken in 1903 on the Gt. Nicobar. A straggler.

B9. CEPORA Billberg.

2γ *nerissa dapha* M. On a brief visit to Tillanchong, Nicobars, in March 1924 I took two dsf♀♀. They may have been stragglers from Burma.

2δ *nerissa lichenosa* M. Common throughout the year, Gt. and L. Andamans and Gt. Cocos. A distinct dsf occurs for both sexes and also in early wsf ♀ before the full wsf comes in. Sexes equally common.

3δ *nadina andamana* Swin. Andamans, N.R. like *lichenosa* flies throughout the year. Bingham says there appears to be no dsf. This is true for males but I have a female taken on February 8th with black markings on the upper side very much restricted. Females of this species are not easily come by.



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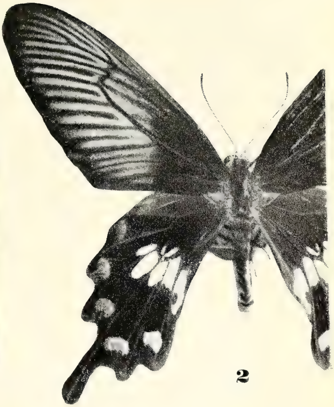

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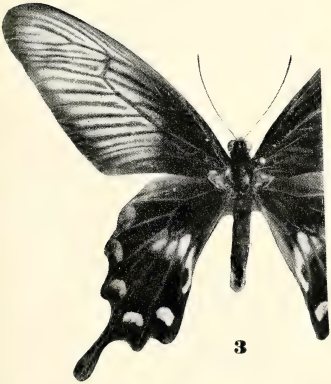

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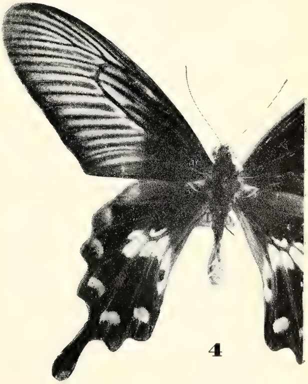

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(1) Tros aristolochiæ goniopeltis Roth. ♂
(2) ,, ,, sawi Evans ♂
(3) ,, ,, camorta M. ♂
(4) ,, ,, kondulana Evans ♂

B10. Appias Hub.

4β *libythea olferna* Swln. My collectors took 2♂♂ and 3♀♀ dsf and 2♂♂ and 1♀ wsf on Car Nicobar. The fact that both dry and wet forms occur may mean that the butterfly is an occasional migrant from the main land. It is extremely rare in Car Nicobar. No dry season forms occur in the Nicobars normally.

5δ *lyncida nicobarica* M. Car and Central Nicobars. Common. This females vary considerably in size and in the amount of black on the upper side.

5η *lyncida galbana* Fruh. Southern Nicobars, N.R.

6β *albina darada* Fd. The British Museum contained no specimens of this race from the Andamans. I have earlier in this paper described how in 1927 it suddenly appeared in the Andamans in great numbers, at least as regards males. I obtained only seven females of which two were v. *flavalba* Fruh.

If it ever reappears in Port Blair, there will probably be no one there interested in butterflies and able to appreciate the rareness of the visit. The specimens taken are exactly similar to those marked Rangoon in the B. M. I took a pair on the Gt. Cocos in April 1930 similar to Port Blair specimens of 1927. A female obtained in Car Nicobar resembles Tenasserim specimens.

7δ *paulina galathea* Fd. Common throughout the Nicobars. There appear to be six forms of ♀

1. upf and uph white
2. upf and uph yellow
3. upf white uph yellow

Each of these three forms may have white or orange below.

These forms are found flying together and are not peculiar to any island or locality.

9. *panda chrysea* Fruh. Gt. Nicobar is the chief habitat of this most aristocratic of all the local *Pieridae*, and I only once took one on any other of the South Nicobars. The males may be taken on wet-sand on the banks of big rivers like the Galathea, in company with males of *cyrestis tabula*, or if you land in one of the sandy bays look for any little stream whose outlet to the sea is headed up by the sand and you should come across a few of the males of these two species, but not the females which are very rare. At the last of some 12 or 15 landings on different parts of the Gt. Nicobar, which I was able to visit only three times in eight years, I took 3♀♀ of *chrysea* in undergrowth inside the jungle.

The Calcutta Museum has a good series of *chrysea*, males but no females. The B.M. has also had no females.

B11. Catopsilia Hub.

1 *crocale* Cr. This is the only *Catopsilia* which approaches being common at Port Blair. I have some 5♂♂ and 10 ♀♀ from there and one or two from Nankauri. It may be classed N. R.

2 *pomona* F. Andamans R. I have 2 ♂♂ and 4 ♀♀ taken in October and April, I have none from the Nicobars.

4 *pyranthe minna* Herbst. N. C. 6 ♂♂ and 2 ♀♀ taken in South Andamans and Gt. Cocos between December and May.

5 *florella gnoma* F. Andamans, R. 4 taken between December and March.

B12. Gandaca M.

γ *harina andamana* M. Common everywhere in the Andamans and for the most of the year, but there seem to be two main broods. No seasonal difference.

δ *harina nicobarica* Ev.—R. taken at Car Nicobar, Nankauri, Gt. and L. Nicobars, in all 7 ♂♂ and 3 ♀♀.

B15. Eurema, Hub.

4 α *blanda silhetana* Wall. Andamans, common January to July.

β *blanda moorei* M.—Northern and Central Nicobars, N. R. 6 ♂♂ from Car Nicobar and 8 from Nankauri. 2 ♀♀ from Nankauri. The males mostly resemble Bingham's figure (Vol. 11, p. 259), but 5 out of 14 have the black border upf. broader at the apex and show the typical *Eurema* projection of black inwards at V. 4. The females much resemble in marking males of *silhetana* from the Andamans and do not resemble their own males as Bingham states they do, except that their ground colour is not paler than that of the males.

γ *blanda grisea* Ev. S. Nicobars, N. R. 14 ♂♂ and 2 ♀♀. One or two of the males have the apical markings upf dark enough to make them difficult to separate from *moorei* found at Nankauri but the rest have merely a powdering of dark scales which gives them a grey appearance in decided contrast to *moorei.* The females here again do not resemble their males, except in having minute dots at the ends of the veins uph. The forewing markings are similar to those of *moorei* ♀, but the ground colour is distinctly paler than that of the males.

5 γ *hecabe hecabe* L. Andamans V. C. dry season forms occur November to March, upf shows little variation, especially among males.

5 δ *hecabe nicobariensis* Fd. Nicobars, V. C. only wet season forms found. They vary considerably, those from the Southern islands being for the most part difficult to separate from Andaman examples of *hecabe hecabe.* The restriction of the border upf is greatest at Chaura and Car Nicobar but not always constant even there. The females especially those from Chaura and Car Nicobar are paler than females of Andaman *hacabe hecabe.*

7 γ *anderson andamana* Swin. Andamans N. R.

I found the males common in the M. and S. Andaman in January and took a fair series of females in the S. Andaman in July to October but, it so happened not both sexes at the same time.

B17. Ixias Hub.

2δ *pyrene andamana* M. Andamans C, Gt. Coco V. C.

The males have distinct dry season markings in January and February, but I can find no seasonal differences among a series of twelve females. Two pairs from the Gt. Coco, April, are smaller than Andaman specimens.

B19 Hebomoia Hub.

δ *glaucippe roepstorffii* WM. Andamans and Gt. Coco. The males are not rare, one sees one or more on most days, but capturing them is another matter. The females are not common. My collector in spite of encouragement brought me only four in some five years. The males are certainly lighter underneath in the dry season but that is the limit of their dimorphism and the females appear to make no change.

B20 Pareronia de N.

2β *ceylanica naraka* M. Andamans and Gt. Coco, C. On the wing throughout the year with a specially large November brood. A pair taken on the Gt. Coco show no difference. No seasonal dimorphism.

C. DANAIDAE

C1 Hestia Hub.

1Σ *lynceus cadelli* WM. & de N. Andamans, N. R. Named after Colonel Tom Cadell, V.C., for 13 years Chief Commissioner at Port Blair. To be taken most days from December to May in dark jungle where it flops slowly about. A sure place was where the path to Black Rock entered well grown secondary jungle five hundred yards or so from Mt. Harriet House.

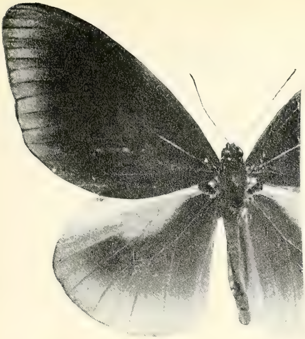
C2 Danaus Lat.

1 γ *aglea melanoleuca* M. Andamans: Common throughout the year, flies weakly in glades and near the ground. Does not, *pace* Bingham, occur in the Nicobars.

2 *agleoides* Fd. Nicobars, V. C. at Nankauri, not quite so common in the S. Nicobars and I have only two ♂♂ from Car Nicobar.

8γ *similis nicobarica* WM. & de N. Southern Nicobars, N.R. I took it on Pulo Milo and L. Nicobar, but chiefly on the Galathea river and the Laful mountain stream in Gt. Nicobar. Sexes taken in equal numbers. I obtained a good series.

9 *limniace mutina* Fruh. Car and Central Nicobars V.C. To be seen in very large numbers on the top of the bank at Sawi Bay, Car Nicobar and is as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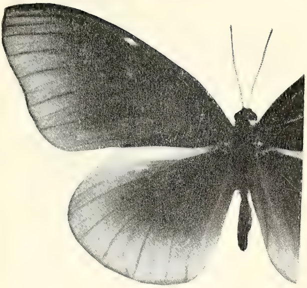
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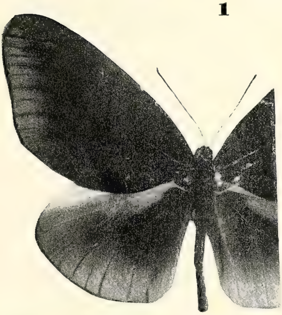
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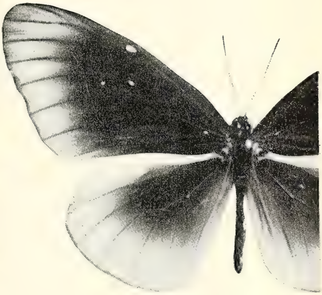
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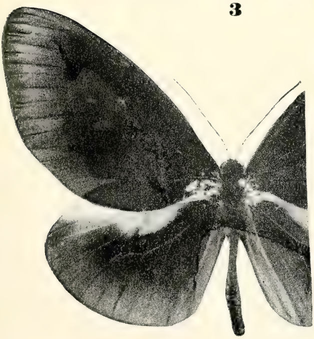
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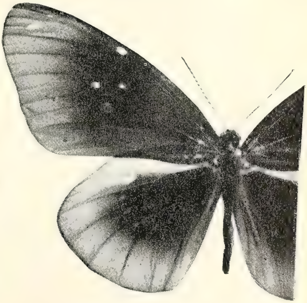
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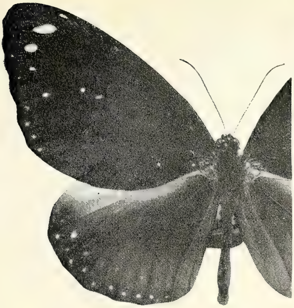
(1) Euplœa climena scherzeri Fd. ♂
(2) ,, ,, ,, ,, ♀
(3) ,, ,, camorta M. ♂
(4) ,, ,, ,, ,, ♀
(5) ,, ,, simulatrix WM. & de N. ♂
(6) ,, ,, ,, ,, ,, ♀



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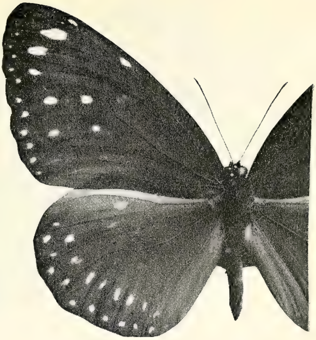

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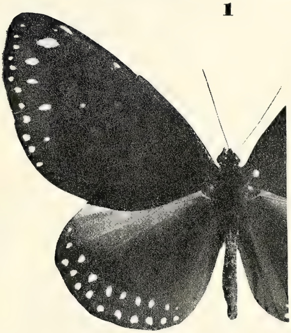

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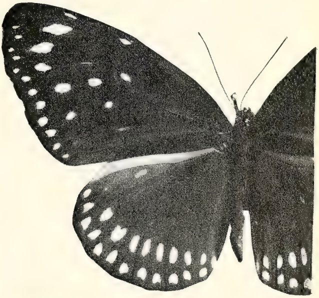

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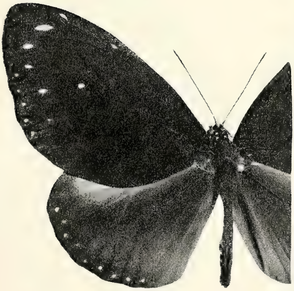

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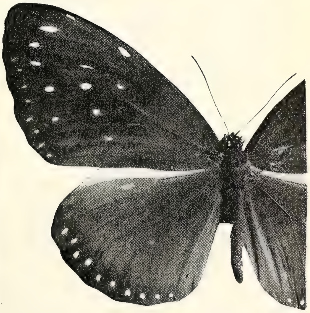

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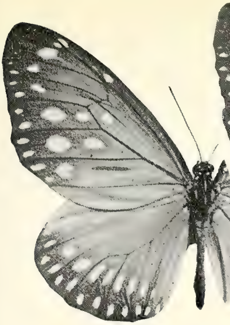
(1) Euplœa crameri esperi Fd. ♂
(2) ,, ,, ,, ,, ♀
(3) ,, ,, biseriata M. ♂
(4) ,, ,, ,, ,, ♀
(5) ,, ,, frauenfeldi Fd. ♂
(6) ,, ,, ,, ,, ♀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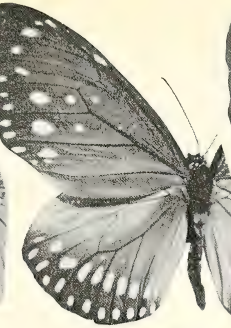
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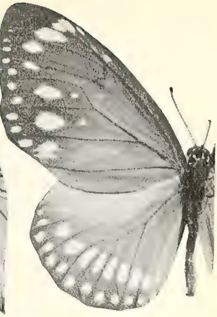
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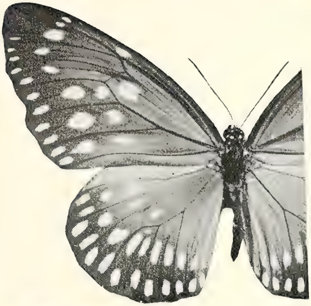
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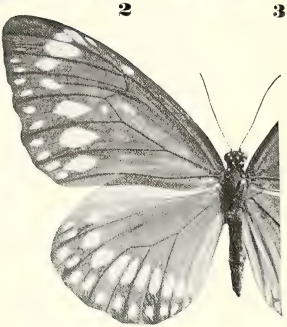
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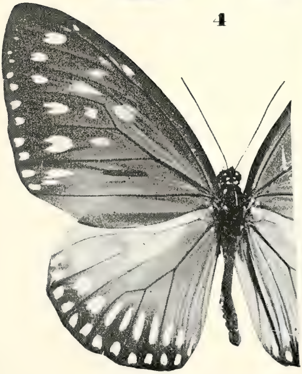
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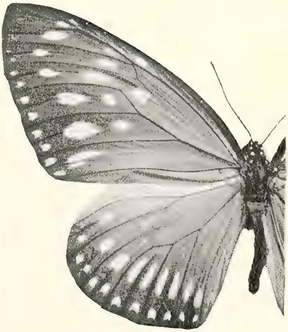
7

(1) Euplœa andamanensis andamanensis Atk. ♂
(4) ,, , ,, ,, ♀
(2) ,, ,, ferrari ♂
(3) ,, ,, bumila Evans ♂
(5) ,, ,, ,, ,, ♀
(6) ,, roepstorfii M. ♂
(7) ,, ,, ,, ♀

common at Nankauri. Never seen in the South Nicobars. I saw a number of specimens on Gt. Coco in April and took a male. Two stragglers seen at Port Blair in September 1929.

10γ *melissa septentrionis* But. 4♂♂ taken, one at Port Blair in November and three at Nankauri in December, January and February respectively. I know of two or three more individuals being taken at Port Blair and the butterfly must be considered a regular if rare visitor.

11β *gautama gautamoides* Doh. Seems to take the place of *mutina* in the South Nicobars where it is decidedly rare. I took 8♂♂ and 3♀♀ in my 15 or so landings in March and September. No really fresh specimens obtained in these months.

12 *plexippus* L. Port Blair, NR. Nankauri, C. I have one specimen from Kachal and none from the remaining Nicobars. WM and de N record it from Car Nicobar. Taken at Port Blair December to April and in September.

13β *melanippus camorta* Ev. Nankauri and probably Kachal, common on the former. The difference between this race and *nesippus* is noticeable and constant.

γ *melanippus nesippus* Fd. Common along the river banks of the Gt. Nicobar but not seen by me on any other island of the Southern group. As conditions now are, and they will hardly improve, this butterfly must continue with *Appias chrysea* and a few others peculiar to Gt. Nicobar to be common or at least not rare in its own habitat but very uncommon in butterfly collections. I myself only secured five pairs.

14. *affinis malayana* Fruh. I received some 20 specimens of this butterfly from the Tahsildar of Nankauri in 1927 and 1929. I was at first under the impression that his man took them on the east side of Kachal, but he later told me they were obtained on the west side of Camorta. No more were forthcoming and their exact habitat remains unknown. I never saw one on the wing on any of the Central group of the Nicobars at any of my numeroue visits. I can accordingly not agree with Brigadier Evans in calling it NR. While the visits of European collectors or their agents remain so unfrequent and so fleeting this must remain a rare Insect in the Nicobars. The Port Blair administration sends its only ship but two or three times a year to Nankauri and its stay there is a matter of five or six hours.

15. *chrysippus* L. I took two ♂♂ and four ♀♀ of this elsewhere commonest of butterflies at Port Blair. Should be taken on the slopes above Brookesabad where a few bushes of its food plant, *Calotropis*, have somehow established themselves. One ♂ at Car Nicobar and two ♀♀ at Nankauri. Its mimic, *hypolimnas mysippus* is found in these same localities equally seldom. The Nicobar examples all have the row of white terminal dots on the upper side of the hind wing complete. Also the Port Blair examples without exception have these spots only in interspaces 1 to 4.

C 3. EUPLŒA F.

1. β *mulciber mulciber* Cr. One ♀ straggler was taken on 6th of May 1930 on Mt. Harriet, a fresh specimen presumably blown over from Madras. Bingham gives the Nicobars as a locality. He may have received a straggler or two from Mr. Rodgers.

*3α *climena scherzeri* Fd. Car Nicobar, V.C. Evans's key says of *climena* generally ' Above normally unmarked dark velvet brown, outwardly cinnamon.' This description can only be applied to the males of the three races. On Car Nicobar about one in every five males of *scherzeri* has a white spot on the costa ; at Nankauri only one *camorta* male out of fifteen is so marked and in the Southern islands *simulatrix* males if spotted have one or two spots at the apex of the wing and never on the costa. The females of all three races invariably have a spot on the costa and generally another near the apex of the cell either inside or in interspace 3. A few females have both these spots present *Simulatrix* females also frequently have one or two apical spots upf similar to those carried by the male. They also may have unh, a terminal row of small white spots in the interspaces.

*β *climena camorta* M. Central Nicobars, VC.

*γ *climena simulatrix* WM & de N. South Nicobars VC.

* 6γ *crameri esperi* Fd. VC. From examination of a long series of forms from Car Nicobar and Mankauri I consider that there is a prime facie case for separation of Nankauri specimens as **crameri biseriata* M. Their general

appearance is invariably much whiter than *esperi* from Car Nicobar or *frauenfeldi* from the Southern Nicobars. One might confuse the two latter with each other so far as the upper sides go, but not the Nankauri form with either.

*δ *crameri frauenfeldii* Fd. Southern Nicobars. Common but less so than in the other groups.

^{8}9α *andamanensis andamanensis* Atk. VC throughout the Gt. Andaman and seen on the Gt. Coco where they appeared normal. On the wing throughout the year. Individuals vary in size and in intensity of ground colour and amount of white marking, but I am unable to couple these variations with the seasons.

*β *andamanensis bumila* Tyt. L. Andaman, VC. Called after Bumila creek on the north of the Little Andaman. Bumila (flies and sand) was the contemptuous name given to the creek by Portman's Andamanese when he explored the island some 60 years ago. The flies remain and pester the visitor and hasten his return to his launch anchored beyond their reach. The beach has behind it a great fresh water lagoon which carries at times quite large numbers of Andaman teal, a fact discovered by me when in search of butterflies. Quantities of *andamanensis bumila* are to be had round the lagoon, also *Spalgis epius nubilis* which is difficult to get in the Gt. Andaman. Bingham mentions the Little Andaman form but as usual refuses it status as a race.

*γ *andamanensis ferrari* Tyt On a visit to North Sentinel, I took a few males of *andamanensis* which have differences from the forms of the Gt. and Little Anandaman and to which General Tytler has given a separate name. One of the plates accompanying this paper shows a male from each of the three localities.

11. β *harrisi harrisi* Fd. One male straggler at Port Blair in March, taken after a gale.

13γ *corus phoebus* But. Nicobars, V.R. A male taken on Kachal in March and a male and a female taken in January and March respectively at Nankauri.

16β *leucostictos novarae* Fd. N.R. at Car Nicobar and a few taken at Nankauri. On the former island its mimic *Hypolimnas antilope anomala* Wall. is found locally.

*17 *roepstorffii* M. Andamans, V.R. I have seen this butterfly moving rapidly, in contrast to *andamanensis* of which it is presumably a mimic, but I never myself took one. My collector who was always on the look out for this *Euploea* only took for me some 15 or 16 in six years. They were mostly got on the Rangachang road four or five miles from headquarters at Port Blair. *Andamanensis* is to be seen everywhere on flowers or hovering near them and I never passed by a single one without a good look to be sure it was not *roepstorffii*, but I never met with the latter except when it was in rapid flight.

D. SATYRIDAE

D2. MYCALESIS Hub.

3γ. *anaxias radza* M. R. A rare and local species in the Gt. Andaman. I think it should be found in bamboo jungle for I saw two or three in the bamboo thickets on the east side near the top of Saddle Peak in the North Andaman in April. Mr. Macmullen assured me that it was to be had in the nullahs on the Rangachang road a mile or two north of the plantation, but my collector could never get it there. In eight years he and I took 8♂♂ and 7♀♀. Of these two males alone were fresh, taken in January and April respectively. Most of the 13 other specimens were taken in December and January. Three males taken in April in the North and Middle Andamans though fresh have a distinct dry season appearance underneath, the ocelli being reduced in size. The remaining five males are from the South Andaman. They were all taken in December or January, but four of the five have the full wet season appearance. Of the seven females, all from the South Andaman, one only, a worm specimen taken in May, has the reduced ocelli of a dry season form. The rest taken chiefly in December, have a wet season appearance.

δ *anaxias manii* Doh. V. R. I have one male and three females from Gt. Nicobar and one female from L. Nicobar. They were taken in rough grass in the coconut groves. April or September.

10γ *mineus nicobarica* M. Nicobars, C.

12γ *visala andantana* M. Andamans C. dsf. December to April, wsf. April to November.

D3. LETHE Hub.

21γ *europa nudgara* Fruh. Andamans. N.R. in shady jungle. Taken throughout the year.

21δ *europa tamuna* deN. Described by de Niceville in 1887 from a female taken on the L. Nicobar. I do not know of any other specimens having been taken. There were none in the Calcutta museum in 1930. I saw a female at Pulo Babi on the Gt. Nicobar.

D. ORSOTRIŒNA Wallen.

β *medus medus* F. Andamans C. dsf as usual December to March.

γ *medus nicobarica* Ev. Nicobars, V.C. especially on Camorta.

D22. MELANITIS Fab.

1 *leda ismene* Cr. Andamans V.C. in both wet and dry season forms on rice land. Nicobars V.R. The wet season form appears in very great numbers in September. Before long the dry season form is found flying with it and then continues alone until February. As the rice land dries off the butterfly seems to take to the jungle. I took one male wsf. on Gt. Nicobar in February.

3η *zitenius andamanica* Evans. Andamans V.R. I have only four males and one female, all dsf. The males were taken, one in October, one in December, two in April of which the last one is very fresh. The female was taken in June, very worn. In the cane thickets at Casuarina Bay in the North Andaman I saw a dozen or more on the wing one day in January, but they were very worn and I let them be. No such opportunity occurred again.

D25. ELYMNIAS Hub.

2β *cottonis cottonis* Hew. Andamans. C. On the wing throughout the year.

3. *panthera mimus* WM. & de N. Nicobars. C. especially on Car Nicobar and at Nankauri.

E. AMATHUSIIDAE

E7. AMATHUSIA Fruh.

γ *phidippus andamanica* Fruh. Middle and South Andamans. R. In eight years only six males and five females taken. These were mostly found at rest in bungalow verandahs where they take cover when the morning daylight gets too strong for them. The 11 individuals caught bear dates from April 1st to May 15th. On Mt. Harriet at 1,200 ft. during the latter half of April this butterfly gets on the wing every evening at ten past six. Any I managed to take with a net were caught at this precise time at the spring 150 ft. below Bungalow No. 3 on the western slope where in my time there was dense shade. A good spot too for skippers. The food plant of *phidippus* elsewhere is the coconut palm, but in the Andamans it must be something else for the coconut is not indigenous. The extensive planting of coconuts during the past 80 years does not appear to have increased the numbers of this butterfly. Only two females and none of the males taken by me have four ocelli unh, the remainder have three, of which the middle one is often minute.

E10. DISCOPHORA Bdv.

4β *continentalis andamanensis* Stg. N., M. and South Andamans. V.R. five males taken in eight years. One in April on the east side of Saddle Peak, two in the South Andaman in April and one in August and lastly one in the Middle Andaman in October. Mr. Field took two females at Aberdeen, South Andaman in May. There is one female with one male in the Calcutta museum, none in South Kensington. The males should be found on damp sand in dark jungle according to de Nicéville.

F. NYMPHALIDAE

F1. CHARAXES Ochs.

2η *polyxena agna* M. A female taken in a battered condition at Namunaghar July 1925 almost certainly a straggler from Burma.

F2. Eriboea Hub.

1γ *schreiberi tissamenus* Fruh. Andamans, V. R. a rather battered female was brought me in 1923. In the succeeding eight years I never saw another of either sex.

2 η *athamas andamanicus* Fruh. Andamans, VR. Three males taken in June of 1925 and 1930. Mr. Field took four males in May 1923 after the first heavy rain.

E8. Herona Db.

γ *marathus andamana* M. Andamans, R. 4 ♂♂ and 5 ♀♀ taken in eight years. Mainly on jungle paths west of Port Blair harbour. Flies in May and June and a stray one or two round Christmas.

F10. Euripus Wd.

1 β *consimilis consimilis* Wd. A straggler was taken by Mr. McMullen 20 years ago.

F18. Euthalia Hub.

5 *cibaritis* Hew. Andamans, C. On the wing for most of the year but especially from July to October. There come days in July and August when one meets with nothing all day in the jungle but a few *cibaritis*. Specimens vary considerably, but I have failed to find any fixed seasonal feature. The white discal band varies in breadth, and the conical black spots vary in size. In the female only the tornal spot as a rule has any blue associated with it. In the males the blue irroration is often found not only surmounting the majority of spots but also forming a well marked marginal band.

14 ξ *garuda acontius* Hew. Andamans, R. A dozen ♂♂ and 4 ♀♀ taken the latter are rare, and I was lucky to have so many. They were got in April, September, December and January. The males mostly in May.

30 δ *teuta teutoides* M. Andamans R. Both sexes fly from late in May to end of July and may sometimes be found on the rotting fruit of one of the smaller figs in darkish jungle.

F20. Parthenos Hub.

δ *sylvia roepstorffii* M. NR. Though a few males may be seen in April and May this is really a July butterfly. I have no females earlier than that month. There is another big brood, chiefly of males, in December. This dry season brood is larger and paler than the July one and it should be added that the white tips upf are generally only found in the males of the December brood. The July males have just a suspicion of whiteness. No female taken by me shows it at all. July specimens have the dark post-discal band upf confluent, December one have it macular.

η *sylvia nila* Evans. Gt. Nicobar, VR. Two males taken by me on 27-9-30, in the stream descending from Mt. Thuillier to Laful in the Gt. Nicobar. Visits to the Southern Nicobars by Government vessels are usually made in March, a time of year when *P. sylvia* is not often seen. This must account for this form not having been taken since Doherty's time (see de Nicéville, Vol. II, p. 149). I have visited Gt. Nicobar in September in other years but never left the flat coast land until my visit to Laful. Brigadier Evans's remark about the confluent post discal band must be discounted. The specimens he examined are wet season ones and follow the rule of *roepstorffii*.

ξ *sylvia cyanoides* Tyt. Little Andaman. R. The Little Andaman is most easily visited in April when vessels may safely anchor and landings be effected. *P. sylvia* not being then on the wing the fact that the Little Andaman form was quite a different colour to *roepstorffii* was never noticed till September 1926 when I took three pairs which were found to have an area of blue on the upper wings similar to but more extensive than that of *nila*, the blue being more a powder blue than the bright cyaneous blue of *nila*. General Tytler has described the form in December 1938 under the name of *P. sylvia cyanoides*. Specimens should be obtainable on the stream that enters Hut Bay at its southern end. Hut Bay is generally a safe anchorage in September before the North-East begins to blow.

F24. Limenitis F.

δ *procris anarta* M. Andamans, NR.
Two main broods, May and December. I have tried to find seasonal differences but there is nothing definite. The spot in the cell upf is occasionally quite large. In half the number of specimens I set it is absent. Males and females in equal numbers. The males are found with the males of the next species, each on his special leaf, 10, 20, or 50 ft. above the ground and darting out every now and then in a fury and then back again for a breather. The road to Black Rock on Mount Harriet always holds a few.

F25. Pantoporia Hub.

2 δ *nefte rufula* de .N Andamans, NR.
Two broods, May and October, a few on the wing most of the year, males and females in equal numbers, but the latter commoner in May. Found with *L. procris* and possesses the same traits.

F26. Neptis F.

1 γ *columella kankena* Evans. S. Nicobars VR.
Two females taken in March, one male in September; these are the only two months in the year when the Andaman station ship visits the Southern Nicobars.
2 γ *jumbah amorosca* Fruh. Andamans, NR.
Easily taken when seen but by no means seen every day or every week. I only took some 25 in all. The dry and wet forms are clearly differentiated. Dry season specimens have the white bands much wider and the dark discal spots unh paler and smaller. The females are scarce in the dry season.
2 δ *jumbah binghami* Fruh. Described from the Nicobars, VR. and never seen by me.
6 δ *hylas andamana* M. Cocos and Andamans, C.
Dry and wet season forms differ though not in so marked a degree as in *jumbah amorosca*. The white discal band uph is narrower and the black edging to this band unh far more pronounced in the wet season forms. Here again the dry season female is scarce and the wet season one very common.
6 η *hylas nicobarica* M. Car Nicobar and Central Nicobars, VC.
6 ξ *hylas sambilanga* Ev. Southern Nicobars C.
This is a very well marked race. Its whole appearance is different to *nicobarica*. It is decidedly a dark insect while in the other white predominates. Both sexes are constantly smaller than *nicobarica*.
7 γ *soma mananda* M. Andamans NR. The males seem commoner in June and the females in January to March. No seasonal variation.
8 γ *nandina clinia* M. Andamans, C. Two strong broods of both sexes in the dry and wet seasons but no seasonal variation noticeable. The males are often very small.
10 γ *sankara nar* deN. I took one male on 1-4-23 in a valley running down from Saddle Peak in the North Andaman to the east coast. Never seen again. There are two faded females and a fresh male in the Dehra Dun Forest Museum, and one female in the British Museum.
17 *ebusa ebusa* Fd.
32 γ *hordonia cnacalis* Hew. Andamans, NR.
Very faithful to localities. There was a point on the Black Rock road where I never failed to see a solitary *hordonia* on the wing. If it was fresh and I took it I would find another next day at the same place. I have separated my specimens according to the dry and wet seasons but cannot refer them to one or other by their appearance. Dry season males are usually much yellower on the upper side.

F27. Cyrestis Bdv.

2β *cocles formosa* Fd. Andamans C. Brigadier Evans has called this butterfly rare, but my collector Bhagwan Din always had it in considerable numbers in May and June at his favourite hunting ground. This is the road to Birchganj where at the foot of the steep hill it enters secondary jungle. Some 50 yards or so from the road is a rare tree, the only one of its kind I ever found at Port Blair, of the size and appearance of an ordinary English holm oak, which in May produces a small white flower as sweet as the English lime and a sure draw for all flower loving butterflies. *Cyrestis*, *doleschallia*, and many *lycaenidae* especially *Lycaenesthes*, *amblypodia*, *tajuria*, *hypolyceana*, *deudoryx* and *rapala* all are to be had on it; some, such as *rapala*, in very great numbers. In the bed of the stream, a perennial, that descends from the Birchganj Pass are more skippers than anywhere else in Port Blair. The Forest Department at Dehra Dun identified this tree but I have lost the record. In the jungle near by are to be had most of the rarer *Nymphalidae* of Port Blair.

v. *andamanica* WM. & deN. Andamans, not common. Flies alongside of *formosa* but in very much fewer numbers, not really rare.

4δ *thyodamas andamanica* WM. Andamans NR, found with *formosa*. The females are uncommon.

5 *tabula* deN. R. Gt. Nicobar and sparingly on Little Nicobar. Not taken on Pulo Milo or Kondul. The males are found in company with males of *Appias panda chrysea* on the sandy edges of fresh water pools above HW mark and on the banks of rivers in the Gt. Nicobar. Only one female and some twenty males taken in some 8 visits to the island. I rank the males as rare owing to the inaccessibility of their habitat. The Gt. Nicobar has, I believe, not been visited by a Government vessel for eight years. Visits when paid are for a very few hours.

F30. HYPOLIMNAS Hub.

1 *misippus* L. Andamans and Car Nicobar. VR.

Probably migratory. Of six individuals taken in the Andamans 5 were caught on 19-10-29 at Mitha Khari. All were worn. The sixth a fresh ♂ was taken on the Little Andaman in September. I took three on Car Nicobar in March, June and August, none fresh.

2 *bolina* L. Andamans VC and Nicobars VR. In the Andamans the dsf begins in September, is very common in October, odd ones to be had in March. The wsf is abundant in June and July. In the Nicobars only the wsf is found, five only taken by me in Car Nicobar, Nankauri and Kondul.

3 *antilope anomala* Wall. Car Nicobar, C.

It is very strange that this Malayan species should be found only in Car Nicobar, the most distant of the Nicobars from Malaya and there in one small locality only. I never saw it on the wing, but my collector often brought me some, and Brigadier Evans took a large series at his visit. Most numerous in December and January, a few to be had up to June and July.

F31. YOMA Doh.

sabina vasuki Doh. Andamans VR.

The first record of this species was July 2nd 1926, when my collector and I took a dozen or more at We Bi near Stewart Sound in the Middle Andaman. One or two were taken a few weeks later at Port Blair. For the next 4½ years of my time in the Andamans I never saw it again. The specimens were fresh and could hardly have crossed from Burma in the height of the south-west monsoon. It would be interesting to know whether *vasuki* was common in Burma in 1926. I understand it appears only at intervals there.

F33. DOLESCHALLIA Fd.

η *bisaltide andamana* Fruh. Andamans NR. Car and Central Nicobars VR.

Taken on flowers on the Birchganj road in June. The Nicobars yielded only 3 ♀♀, of which two from Car Nicobar in January and February and one from Nankauri in August. There is one specimen only in the B.M. from the Nicobars.

F34. KALLIMA B de V.

3 *albofasciata* M. Andamans R. Only some four or five pairs taken, mainly on the Birchganj road and in the Middle Andaman. June and July; one ♀ in October.

F35. PRECIS Hub.

1 β *hierta magna* Evans. Andamans C.

Found in the cleared parts of the Port Blair settlement.

Specimens vary considerably but there seems to be no seasonal dimorphism.

2 β *orithya ocyale* Hub. A straggler taken on Car Nicobar.

4 α *almana, almana* L. Andamans C. Seasonal dimorphism occurs.

β *almana nicobariensis* Fd. Car Nicobar. C. My specimens all taken in April wsf only. I cannot find any striking difference in size between α wsf and β.

5 *atlites* L. S. Andamans. NR. April to June. wsf only taken. Nicobars, Nankauri only January to April, NR. The Nankauri specimens are washed out looking and paler than those from Port Blair and the markings on underside are obsolescent.

F36. VANESSA Fd.

1 *cardui* L. Two stragglers taken at Port Blair and two at Nankauri, all in the South-west monsoon.

F41. CUPHA Hub.

δ *erymanthis andamanica* M. Andamans, NR.

To be taken sparingly in secondary jungle such as on the Birchganj and Maimyo roads, March to August.

η *erymanthis nicobarica* Fd. Central and South Nicobars. NR. February and March. This race is very distinct from the Andaman one and its general appearance is very much paler. There is no mistaking the two.

F42. ATELLA Db.

1 *phalanta* Drury. Two pairs taken in the Central Nicobars three individuals in January—March 1929 and one in February 1930, presumably stragglers from Burma.

2 η *alcippe andamana* Fruh. Andamans, Gt. Coco VC.

I have seen this butterfly in clouds in April and there is another big brood in October. About April 20th, 1924, the perennial streams running down from Mt. Harriet to Bamboo Flat and Stewartganj contained hundreds of thousands of males in patches on the sand. For several days after there was a thin migratory stream of females flying from north to south past the Chief Commissioners house on Mt. Harriet, at the rate of 200 a minute for several hours at a time. In April of another year Ross Island which lies to the south of Mt. Harriet was flooded with this butterfly. I also noticed it on an occasion at We B in the Middle Andaman in a similar flight, again from North to South.

2 ξ *alcippe fraterna* M. Central and South Nicobars R.

Of nine individuals one ♀ was taken in September, the rest January to March.

F44. CYNTHIA F.

δ *erota pallida* Stg. Andamans, C.

deNiceville says that ♀♀ of *erota* are rare in Continental India, but they are to be taken in fair numbers in the Andamans. The Black Rock road on Mt. Harriet is a good locality and so is any other jungle road in the islands.

F45. CIRROCHROA Db.

1 *fasciata* Fd. I took one individual on 13th April 1923 on Mt. Harriet. Mr. Field during the same week and at the same place took eight. The butterfly was not noticed again during the next eight years. Presumably stragglers from Burma.

3 β *tyche anjira* M. Andamans, C.

Both sexes to be had March to September, ♀♀ commoner than ♂♂ in April.

7 *nicobariea* WM. & deN. Gt. Nicobar C.

Considerable numbers of this butterfly in the Mt. Thuillier streams taken in March and September.

F47. CETHOSIA F.

1 β *biblis andamana* Stich. Andamans C.

Not taken on Mt. Harriet but common at the foot of the range in the Wimberleyganj forest plantations ; both sexes May to July, ♀♀ in December.

γ *biblis nicobarica* Fd. All the Nicobars. C.

I have examined large series of these two races and found the post discal linee as described by Brigadier Evans, that is in the Andaman form the line is broken and in the Nicobar one it is continuous, otherwise the races appear identical.

F50. Laringa M.

2 β *horsfieldii andamanensis* deN. Andamans. ♂♂ NR. ♀♀ R.

I took 12 of the former and seven of the latter in eight years. A very local butterfly. Certain spots on the Black Rock Road usually had one ♂ sitting 20 ft. or so up on a leaf in rivalry with males of *L. procris*, *P. nefte*, etc. If this one were caught there would usually be another on duty at the next visit.

G. ERYCINIDAE

G4. Abisara. Fd.

5 η *echerius bifasciata* M. Andamans NR.

An uninteresting creature. ♂♂ July—September.
♀♀ April—December.

H. LYCAENIDAE

H8. Spalgis.

α *epius epius* Wd. 2 ♂♂ and 3 ♀♀ from Gt. Nicobar taken in February and March.

β *epius nubilus*, M. Ross Island, Port Blair. Found in great numbers in mangrove behind Bumila Beach, Little Andaman. One ♀ from Gt. Nicobar.

H11. Castalius

1 β. *rosimon alarbus* Fr. V.C. in Andamans in December to April. Also common in Central but rare in S. Nicobars.

3 α. *ethion ethion* Dh. & Hew. All Andamans most of the year, C.

β *ethion airavati* Doh. Common on Kondul and Gt. Nicobar, not taken elsewhere.

4. *elna noliteia* Fruh. Andamans, December to May. N.R.

5 β. *roxus roxus* God. All Andamans February to September. N.R.

γ. *roxus manluena* Fd. Flies with *airavati* on Kondul and Gt. Nicobar. R.

H17. Neopithecops Zalmora But. December to June in Andamans C.

H18. Everes.

5 γ. *parrhasius pila* Evans. Common on Car Nicobar. One ♀ each from Nankauri and Gt. Nicobar.

H20. Megisba

β. *malaya sikkima* M. Andamans C.

γ. *malaya presbyter* Fruh. Central and South Nicobars. 2 ♂♂ and 3♀♀ taken, R.

H21. Lycaenopsis

2 δ. *puspa telis* Fruh. On Mt. Harriet ridges, March to April, when it is not rare. A few in December.

η. *puspa cyanescens* deN. One ♀ from Car Nicobar, V.R. de Roepstorff took only five individuals in Camorta, Central Nicobars, where he lived some years.

ζ. *puspa prominens* deN. Also extremely rare. Mr. Man took one ♀ on Little Nicobar and I took another ♀ on Gt. Nicobar.

24. Zizera

5. *gaika* Trimen. S. Andamans C.

6 β. *otis otis* P. Andamans, Car and Central Nicobars V.C.

H25. EUCHRYSOPS

1. *cnejus* F. Andamans. C. Central and South Nicobars C.

3 β. *pandava pandava* Hors. All Andamans and Nicobars, V.C. owing to the prevalence of a wild *Cycas* which the larvae damage very severely. One tree in Government House garden was killed outright. Also taken in Great Coco.

H26. LYCAENESTHES

1 β *emolus andamanicus* Fruh. Mt. Harriet hedges October to April N.R.

2 β *lycaenina lycambes* Hew. As above but taken chiefly in April and May N.R.

H27. CATACHRYSOPS

1. *strabo* F. Andamans and Nicobars V.C.

2. *lithargyria* M. Andamans, especially Little Andaman. Nicobars especially Car, V.C.

H28. LAMPIDES.

boeticus, L. Andamans, chiefly in Jail Garden. Nicobars generally but rare, possibly a migrant only.

v. *obsoleta* Evans. Sent to Brigadier Evans by Jailor Macmullen. Never taken by me.

H29. JAMIDES.

1 α *bochus bochus* Cr. Andamans, Gt. Coco. V.C.

β *bochus nicobaricus* WM & deN. All Nicobars. V.C. Both races mainly in March.

5 γ *celeno blairana* Evans. V. Common throughout the Andamans, throughout the year.

δ *celeno kinkurka*, Fd. V. C. Car and Central Nicobars.

η *celeno nicevillei* Evans. Common in South Nicobars. Evans says 'entirely overlaid fuscous scales.' de Nicéville says 'leaden (sooty) instead of opalescent whitish.' This hits off the difference between *kinkurka* and *nicévillei* rather better.

7 *ferrari* Evans. This new species was detected by Evans who found a pair in my collection. One from Camorta and one from the South Nicobars. One more was found in the General Collection in the British Museum. They are the only three known specimens. One of mine was taken on the little stream on Kondul and more should be forthcoming there.

8 α *kankena pseudelpis* But. Common at Bomlungta but less common in the South Andaman. December to April.

β *kankena kankena*, Fd. All Nicobars. January to July. R.

9 γ *alecto fusca* Evans. Common on all Andamans especially on Black Rock road, Mt. Harriet, where the food plant, wild cardamum, is common.

δ *alecto kondulana* Fd. Central and South Nicobars. Rare, especially the female.

H32. NACADUBA

De Nicéville states that the females of all the species appear to be very rare in all localities. This does not apply in the Andamans or Nicobars where both sexes are equally obtained.

2 δ *pactolus andamanicus* Fruh. All Andamans mainly June and July C.

η *pactolus macropthalma*, Fd. Throughout the Nicobars, C. excepting in Car Nicobar.

3 *hermus major* Evans. South Nicobars, February and March. R.

4 *vajuva varia* Evans. Three taken in Kachal and Gt. Nicobar. R.

5 *pavana* Hors. Andamans, Januray—May C.

6 *ancyra aberrans* El. One male taken on Car Nicobar and one on Tillanchong. R.

7 γ *helicon brunnea* Evans. Andamans, April, on Mt. Harriet hedges. C.

8 δ *helicon kondulana* Evans. Camorta and Kondul. Only four taken, R,

8 γ *kurava euplea* Fruh. Andamans C.
δ *kurava nicobarica* Toxopeus. South Nicobars. R.
9 β *beroe gythion* Fruh. Andamans. April to June C.
12 β *berenice plumbeomicans*, WM & deN. Andamans C.
γ *berenice nicobarica* WM & deN. All Nicobars C.
13 *aluta coelestis* deN. Andamans, April to July. Chiefly taken on Mt. Harriet. R.
15 *nora nora*, Fd. As for 13 but V.C.
nora dilata Evans. All Nicobars NR.
16 *dubiosa fulva* Evans. I took two females on Ross Island, May and August. R.
19 *dana* deN. Andamans, January—May. R.

H35. HELIOPHORUS

2 *epicles indicus* Fruh. Only at Bomlungta, M. Andaman, where it is common. Two broods, June and December.

H44. CURETIS

2 *saronis saronis* M. Andamans and Gt. Coco. NR.
saronis obscura, Evans. Always some white uph.
Car and Central Nicobars. C.
saronis nicobarica Swin. No white on uph.
S. Nicobars. NR. The females of all three forms are more commonly taken than males.

H45. IRAOTA

1 γ *timoleon timoleon* Stoll. 5♂♂ and 3♀♀ all taken in December 1930 and April 1931 on Mt. Harriet, mainly on *ficus benjamini.* R.

H46. HORSFIELDIA

η *anita andamaniea* Ril. Some 20 taken between April and August 1929 and 1930. Not otherwise seen. Mt. Harriet only. R.

H49. AMBLYPODIA

31 β *alea constanceae* deN. Only two ♂♂ taken. One when I took my only *Neptis sankara nar* below Saddle Peak, North Andaman in April 1924, another on Mt. Harriet in May 1930. V.R.
36 δ *centaurus coruscans* WM & deN. Andamans and Gt. Coco. C.
49 *alesia* Fd. described under *wimberleyi* by de Nicéville from two females received from Port Blair. Not taken by me. VR.
56 *asopia asopia* Hew. recorded from Andamans by de Nicéville under *tounguva* from two males sent by Wimberley. Never seen by me.
57 *zeta* M. 4 ♂♂ and 2 ♀♀ taken, two in each of the years 1926, 1929, and 1931.
80 *fulla andamanica* WM & deN. A dozen of each sex taken in five days from the same fig tree (*F. benjamini* ?) near Government House Mt. Harriet, mid December 1930, otherwise not seen. R.

H50. SURENDRA

1 *qurcetorum latimargo* M. All Andamans, May to July, and Gt. Coco, October. N.R.

H53. LOXURA

δ *atymnus prabha* M. Andamans C.
η *atymnus nicobarica* Evans. All Nicobars N.R. All specimens from Car Nicobar are the palest, the colour increasing as one goes south. The two races remain, however, unmistakable.

H57. SPINDASIS

13 δ *lohita zoilus* M. Andamans December to June. 7 ♂♂ and 6 ♀♀ in all taken in two out of my eight seasons. R.

H59. Pratapa

5 β *deva lila,* 3 ♂♂ and 2 ♀♀ taken during two successive Aprils on Mt. Harriet VR.

H60 Tajuria.

1 γ *jangala andamanica* WM. Some 25 including 9 ♀♀ taken on hedges on Mt. Harriet and also on cashew trees on open spurs of the hill leading down to Wimberleyganj, all in April 1924, a very notable year for strong blues. R.

19 β *cippus cippus* F. Some 18 taken on Mt. Harriet hedges, February to April. R.

H61. Charana

1 α *jalindra tarpina* Hew. Eight males March to July, three females April, all from Mt. Harriet. R.

2 *mandarinus* Hew. recorded from the Andamans. Not by me.

H77. Horaga

1 *onyx rana* deN. de Niceville records three males and four females. I too six males, one or two a year on the South Andaman, between March and August. V.R.

3 *albimacula* WM & deN. de Niceville records seven males only. My collector took 3 pairs off one small bush near WeBi, Middle Andaman on 8-6-27. No others. V.R.

H 79. Chliaria

1. *othona* Hews. Two males and one female taken on Mt. Harriet, May to July. VR.

H 80 Hypolycaena

2β *thecloides nicobarica* Evans. Central and Southern Nicobars. A pair from Camorta have a distinct triangular fulvous patch upf. The rest are all uniformly dark brown. Taken in open coconut groves near beaches. R.

3β *erylus andamana,* All Andamans and Gt. Coco, September to February. N.R.

H 82. Artipe

eryx L. Recorded only from Bomlungta in the Middle Andaman. As this station was closed during my time I only paid it two flying visits and never took or saw *eryx*. Even at Bomlungta it is rare. Curious that this species and *H. epicles* should be confined to this one small locality.

H 83. Deudoryx

1. γ *epijarbas amatius* Fruh. Andamans, April and May, C. Nicobars. VR. One worn female taken in March on Kondul.

H 84. Virachola

3β *smilis maseas* Fruh. Three pairs in all taken on the South Andaman. October to March. VR.

H 85. Rapala.

7β *suffusa rubicunda* Evans. Birch Ganj and Mt. Harriet, South Andaman. Males emerge in January, females in March, both on the wing till June. VC.

11γ *varuna orseis* Hew. As for last. VC.

γ *varuna rogersi* Swin. Two fresh males from Camorta in January, no others taken. VR.

12 *schistacea* M. Andamans, found with *orseis*. VC.

15 *dieneces intermedia* Stg. As above. VC. The blue rapalas have a shorter season than the red. All four are very plentiful.

H 87. BINDAHARA

β *phocides phocides* F. All Andamans, mainly in April, but a few males in October and December. R.

γ *phocides areca* Fd. All Nicobars, most of the year. C. Both forms very variable in size, sexes equally obtainable.

I. HESPERIIDAE

1. HASORA

1 β. *badra badra* M. Two males from Andamans, one female from Gt. Nicobar. N.R.

9. *leucospila parnia* Fruh. Recorded from Nicobars, not taken. V.R.

10. *salanga* Pl. Recorded from Nicobars, not taken.

13 β. *vitta vitta* But. Andamans. A big flush emerges in April, again in September. N.R.

14. *khoda minsona* Swin. One female taken in April in the South Andaman. V R.

15 γ. *taminatus almea* Swin. Two females from South Nicobars. R.

δ *taminatus malayana* Fd. Six males, two females from South Andaman in April. C. Recorded from Car and Central Nicobars.

16. *alexis* F. One male from Kondul in April. I should have taken more, both in the Nicobars and the Andamans.

I 2. ISMENE

η *jaina astigmata* Evans. Two males from South Andamans in May. VR.

13. *harisa harisa* M. Recorded from Andamans.

16 *amara* M. Three worn specimens from South Andaman taken in May, July and November. V.R.

I 3. BIBASIS

ζ *sena sena* M. One male from from South Andaman.

I 5. BADAMIA

exclamationis Fab. One male and three females from South Andaman and Gt. Coco, April and May. R.

I 11. CELÆNORRHINUS

16β *leucocera leucocera* Koll. One male and four females from South Andaman. C.

30. *andamanica* WM & deN. One female taken at the mouth of Bumila Creek, Little Andaman in April. V.R.

I 14. TAGIADES

3 δ. *obscurus alica* M. Andamans. N.R.

5γ. *atticus ravina* Fruh. Andamans. N.R.

γ. *atticus carnica* Evans. Car Nicobar. Four males named by Evans since publication of his book. N.R.

δ. *atticus helferi* Fd. Central and South Nicobars. N.R.

10. *litigiosa andamanica* Evans. Andamans. N.R.

Also a pair of seasonal form *major* Evans.

I 19. DAIMIO

6. *bhagava andamanica* WM & deN. Three pairs from South Andaman. Recorded from Nicobars. R.

I 21. SARANGESA

3 γ. *dasahara dasahara* M. Andamans. C.

I 39. ASTICTOPTERUS

jama permagnus Fruh. Recorded from Andamans.

I 47. Suastus

3. *rama aditus* M. Andamans and Gt. Coco. N.R.

I 58. Notocrypta

4 γ *paralysos paralysos* WM & deN. Only three by me in Andamans. Recorded from Nicobars. R.
6 *curvifascia* Fd. Andamans. C.

I 59. Gangara

1 γ. *thyrsis yasodara* Fruh. Andamans and S. Nicobars. N.R.

I 60. Erionota

1 *thrax acroleuca* WM & deN. Eight taken. Andamans and Nicobars April. R.

I 61. Paduka

1 γ. *lebadea andamanica* WM. Six taken. Andamans. R.

I 64. Matapa

1 *aria* M. Four taken. Andamans. C.
3 *druna* M. Three pairs. Andamans. N.R.
5 *shalgrama* M. Recorded from Andamans.

I 66. Hyarotis

1 *adrastus praba* M. A dozen taken. Andamans. N.R.

I 68. Zographetus

3 *ogygia andamana* Evans. Three males. Andamans. R.

I 83. Halpe

31 α. *moorei moorei* Watson. Five taken. Andamans. N.R.

I 87. Cupitha

purreea purreea M. Eleven taken. Andamans. N.R.

I 89. Oriens

3 β. *gola gola* M. Eight taken. Andamans. N.R.

I 90. Padraona

6 γ *maesoides ottalina* Evans. Described from Andamans. Not taken.
14 γ *tropica nina* Evans. Seven taken. Andamans. C.
16 α *serina serina* Plotz. Six taken. Andamans. R.

I 91. Astycus

augias augias L. and *pythias bambusae* M. Both recorded from Andamans Not taken.

I 92. Cephrenes

3 *palmarum nicobarica* Evans. Car Nicobar C. and Gt. Nicobar N R.

I 97. Baoris

1 *oceia scopulifera* M. Eight taken. Andamans. N.R.
7 *cahira cahira* M. Nine taken. Andamans. R.
31 *agna agna* M. (Mathias). Andamans. C.
33 *zelleri cinnara* Wallace. Andamans and Nicobars. C.

This list of *Hesperiidae* is noticeably bald and incomplete, and should be capable of very considerable improvement.

ON THE FOOD-PLANTS OF INDIAN GEOMETRIDAE AND PYRALIDAE

BY

D. G. SEVASTOPULO, F.R.E.S.

This paper is the third of the series started by that *On the Food-plants of Indian Bombyces* (Heterocera), (1940, Journ. Bomb. Nat. Hist. Soc., xli, 817–27) and followed by one *On the Food-plants of Indian Agaristidae and Noctuidae*, (1941, *ibid*, xlii, 421–30).

The two families treated in the present paper appear to have been even more neglected than the Bombycidae and Noctuidae, they are probably less important from the economic point of view, and recorded food-plants are very few. I have been able to obtain a number of records from Lefroy's *Indian Insect Life*, but unfortunately the copy I have been able to consult is incomplete, the pages dealing with the Geometridae being missing.

I have used the same abbreviations as in the two previous papers, the only fresh one being 'Lefroy' for *Indian Insect Life*.

GEOMETRIDAE

OENOCHROMINAE

Ozola Wlk.
O. microniaria Wlk.—Premna latifolia (Lep. Ceyl., Seitz).
Some Australian species feed on Eucalyptus.

HEMITHEINAE

Pingasa Moore
P. ruginaria Guen.—Nephelium lichi (mihi).
P. chlora Cr.—Coffee (Lep. Ceyl., Seitz).

Terpna H.—Sch.
T. ornataria Moore—Laurineae sp. (mihi).

Dindica Moore
D. polyphaenaria Guen.—Laurineae sp. (mihi).

Dysphania Prout
D. prunicolor Moore—Carallia (Lep. Ceyl., Fauna, Seitz).
D. palmyra Stoll.—Carallia integerrima (Lep. Ceyl., Fauna, Seitz).

Agathia Guen.
A. lycaenaria Koll.—Oleander (mihi).
A. laetata F.—Oleander (Lep. Ceyl., Fauna, Seitz, mihi), Carissa carandas (mihi).

Hipparchus Leach
H. papilionaria L.—Birch (non-Indian).

Tanaorrhinus Btlr.
T. vittata Moore—A pupa was found in a curled leaf of Quercus sp. (mihi)

Anisozyga Prout
An Australian species feeds on ferns.

Chloromachia Warr.
C. divapala Wlk.—Myrtus (Lep. Ceyl., Fauna).

Lophomachia Prout
L. semialba Wlk.—Loranthus (Lep. Ceyl.), Myrtus (Seitz).

Osteosema Warr.
O. sanguilineata Moore—Maesa chisia (mihi).

Rhomborista Warr.
R. pannosa Moore—Loranthus (Lep. Ceyl., Fauna, Seitz).

Comibæna Hbn.
C. cassidara Guen.—Zizyphus, Ixora (Seitz mihi), Lagerstroemia indica (mihi).

Gelasma Warr.
G. dissimulata Wlk.—Terminalia catappa (Seitz).

Thalassodes Guen.
T. quadraria Guen.—Polyalthea longifolia (mihi).
T. veraria Guen.—Rose, Chrysanthemum flowers, Lagerstroemia flos-reginæ (mihi).
T. dissita Wlk.—Barringtonia (Lep. Ceyl.).

Oenospila Swinh.
O. flavifusata Wlk.—Barringtonia (Lep. Ceyl.), Eugenia jambos (Aiyar, *Journ. Bomb. Nat. Hist. Soc.*, xliii, 673).

Hemithea Dup.
H. tritonaria Wlk.—Ficus (Fauna).

Iodis Hbn.
I. argutaria Wlk.—Rubus sp. (mihi).

STERRHINAE (ACIDALIINAE)

Ptochophyle Warr.
P. togata F.—Eugenia jambolana (mihi).

Chrysocraspeda Hamps.
C. abhadraca Wlk.—Eugenia (Lep. Ceyl.).

Scopula Schrank.
S. emissaria Wlk.—Aeschynomene indica (mihi).
S. cleoraria Wlk.—Lantana sellowiana, Plumbago capensis (mihi).

LARENTIINAE

Cidaria Treit.
C. silaceata Schiff.—Impatiens sp. (mihi).
C. delecta Btlr.—Virginia Creeper (mihi).
C. aurigena Btlr.—Impatiens sp. (mihi).
C. obfuscata Warr.—Impatiens sp. (mihi).

Photoscotosia Warr.
P. miniosata Wlk.—Rubus sp. (mihi)

Callabraxas Btlr.
C. amanda Btlr.—Saxifragaceæ sp (mihi).

Phthonoloba Warr.
P. decussata Moore—Rose, Apple, Citrus spp. (mihi).

BOARMIINAE

Abraxas Leach.
A. grossulariata L.—Ribes, Euonymus, Calluna and many others (non Indian).
A. sylvata Scop.—In Europe on Elm.

Peratophyga Warr.
P. aerata Moore—Hypericum sp. (mihi).

Urapteryx Leach
U. sambucaria L.—Ivy (non-Indian).

Thinopteryx Btlr.
T. crocoptera Koll.—Vine, Virginia Creeper (mihi).

Osicerda Wlk. (Prionia Hbn.)
O. squalidaria Hbn.—Ixora (Lep. Ceyl.).

Leptomiza Warr.
L. calcearia Wlk.—Rubus sp. (mihi).

Macaria Curt.
M. fasciata F.—Mimosa concinna (Lep. Ceyl., Fauna).
M. fidoniata Guen.—Acacia catechu (Lac Research Institute Bulletin).

Orsonoba Wlk.
O. clelia Cr.—Convolvulaceae (Lep. Ceyl., Fauna).

Hyposidra Guen.
H. talaca Wlk.—Jambona, Combretum, Ficus parasiticus (Lep. Ceyl., Fauna), Castor (mihi).

Luxiaria Wlk.
L. obliquata Moore—Melastoma normale (mihi).

Petelia Herr.—Sch.
P. medardaria Herr.—Sch.—Zizyphus jujuba (mihi).

Fascellina Wlk.
F. chromataria Wlk—Cinnamomea (Lep. Ceyl., Fauna).
F. plagiata Wlk.—Laurineae (mihi).

Biston Leach.
B. suppressaria Guen.—Cassia auriculata (Lep. Ceyl., Fauna), Cassia sp., Lagerstroemia indica, Carissa carandas (mihi).
B. bengaliaria Guen.—I suspect Pine trees.

Medasina Moore.
M. strixaria Guen.—Acanthads (Lep. Ceyl.).
M. albidaria Wlk.—Rose, Cherry (mihi.).

Boarmia Treit
B. bhurmitra Wlk.—Rose, Geranium, Maesa chisia, Sympocos sp., Melastoma normale (mihi.).
B. boarmiaria. Guen,—Plumbago rosea (Lep. Ceyl.).
B. selenaria Hbn.—Apple (mihi).
B. acaciaria Bsd.—Cinnamomea (Lep. Ceyl., Fauna), Rose, Apple, Pansy (mihi).

Psyra Wlk.
P. spurcataria Wlk.—Rose, Maesa chisia (mihi).

PYRALIDAE

GALLERIINAE

On wax in bee hives and nests of wild bees (Lep. Ceyl.).

Trachylepidia Rag.
T. fructicassiella Rag.—Pods of Cassia fistula (Fauna, mihi).

Achroia Hbn.
A. grisella F.—Wax in bee-hives (Fauna).

Lamoria Wlk.
L. anella Schiff.—Fallen indigo leaves (Lefroy).

Galleria F.
G. mellonella L.—Parasitic in bee-hives (Fauna), bee comb (mihi).

CRAMBINAE

Usually grass or reed feeders (Fauna), amongst moss in grassy places or in the stems of aquatic plants (Lep. Ceyl.).

Chilo Zinck.
C. simplex Btlr.—Cultivated cane, Juar, Bajra, Maize (Lefroy).
C. zonellus Swinh.—Jowar, Wheat, Maize, Bajra (Trehan and Pingle, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 141).

Ancylolomia Hbn.
A. chrysographella Zell.—Grass, Rice (Lefroy).
A. locupletella Koll.—Spinifex squarrosa (Fauna, Lefroy).

SCHOENOBIINAE

In the interior of reeds (Fauna).

Scirpophaga Treit.
S. auriflua Zell.—Sugarcane, Saccharum cilare (Lefroy).
S. nivella F,—Sugarcane (Trehan and Pingle, *Journ. Bomb. Nat. Hist. Soc.* xlvi, 141).
S. monostigma Zell.—Sugarcane, Saccharum cilare (Lefroy).

Schoenobius Dup.
S. bipunctifer Wlk.—Rice, probably grasses (Lefroy), Paddy (Trehan and Pingle, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 144).

ANERASTIINAE

Anerastia Hbn.
A. ablutella Zell.—Sugarcane (Lefroy).

Polyocha Zell.
P. saccharella Dudg.—Sugarcane (Lefroy).
P. cinerella Hamps.—Euphorbia neriifolia (Lefroy).

PHYCITINAE

On leaves or in the stems of plants, some in dried animal or vegetable substances (Lep. Ceyl.).

Ephestia Guen.
E. cautella Wlk.—Rice and wheat flour, tamarind seeds (Lefroy).
E. cahiritella Zell.—Rice and wheat flour (Lefroy).

Heterographis Rag.
H. verrucicola Hamps.—In wart-like excresences on Trema orientalis, tunnelling in the diseased wood (Fauna).
H. bengalella Rag.—In Custard Apple fruits (Fauna).

Euzophera Zell.
E. perticella Rag.—Brinjal (Lefroy, Trehan and Pingle, *Journ. Bomb. Nat. Hist. Soc.*. xlvi, 147).
E. punicaeella Moore.—In Pomegranate fruits (Fauna).
E. cedrella Hamps.—Deodar cones (Lefroy).

Microthrix Rag.
M. inconspicuella Rag.—Sugarcane (Lefroy).

Nephopteryx Hbn.
N. eugraphella Rag.—Cured Tobacco, Mimusops elengi (Fauna).
N. divisella Dup.—Euphorbia (Fauna).
N. paurosema Meyr.—Pods of Cassia tora (Lefroy).
N. semirubella Scop.—Lotus, Hippocrepis, Trifolium, etc. (Fauna), Maize (Lefroy).

Myelois Hbn.
M. pectinicornella Hamps.—Seeds of Pongamia glabra (mihi).

Hypsipyla Rag.
H. robusta Moore.—In the small branches of mahogany (Fauna), in shoots of Cedrela toona (Lefroy).

Phycita Curt.
P. dentilinella Hamps.—Chitin (Lefroy).
P. clientella Zell.—Solanum (Lefroy).
P. infusella Meyr.—Cotton (Lefroy, Trehan and Pingle, *Journ. Bomb. Nat. Hist. Soc.* xlvi, 145).
P. jasminophaga Hamps.—Flower buds and young leaves of Jasminum sambac (Fauna).

Etiella Zell.
E. zinckenella Treit.—In pods of Colutea, Crotalaria juncea, Phaseolus, etc, (Fauna).

EPIPASCHIINAE

Coenodomus Wlsm.
C. hockingii Wlsm.—Eugenia jambolana (Fauna).
C. rotundinidus Hamps.—A tree of the Laurel tribe (Fauna).

Orthaga Wlk.
O. exvinacea Hamps.—Mango (Trehan and Pingle, *Journ. Bom. Nat. Hist. Soc.*, xlvi, 150).
O. vitialis Wlk.—Cinnamomium (Lep. Ceyl).

CHRYSAUGINAE

ENDOTRICHINAE

Nothing recorded concerning the Indian species.

PYRALINAE

Hypsopygia Hbn.
H. mauritialis Bsd.—Wax, larvae, etc. in nests of Polistes hebraeus (Lefroy).

Pyralis L.
P. farinalis L.—Oatmeal, Potato, etc. (Lefroy).

HYDROCAMPINAE

The larvae of some epecies of *Nymphula* feed on water-plants and are fitted for a life below the surface of the water (Fauna).

Nymphula Schrank.
N. affinialis Guen.—Water plants (Lefroy)
N. fluctuosalis Zell.—Rice (Fauna).
N. depunctalis Guen.—Rice (Lefroy), Paddy (Trehan and Pingle, *Journ. Bomb. Nat. Hist. Soc.*, xlvi, 144).

SCOPARIINAE

The larvae feed on mosses and lichens, except in a few ancestral forms in New Zealand, which are grass feeders (Fauna).

PYRAUSTINAE

Pycnarmon Led.
P. cribrata F.—Coleus parviflora (Aiyar, *Journ. Bomb. Nat. Hist. Soc.*, xl, 336).

Zinckenia Zell.
Z. perspectalis Hbn.—Amaranthus, Beetroot, Maize, Garden plants (Lefroy).
Z. fascialis Cr.—Impatiens sp. (mihi).

Cnaphalocrocis Led.
C. medinalis Guen.—Rice, grasses (Lefroy).

Marasmia Led.
M. trapezalis Guen.—Maize, Juar, Bajra (Lefroy).

Syngamia Guen.
S. abruptalis Wlk.—Ocinum sanctum (Lefroy).
S. floridalis Zell.—Urticaceae sp. (mihi).

Caprinia Wlk.
C. conchylalis Guen.—Kicksia, Holarrhena antidysenterica (Lefroy).

Filodes Guen.
F. fulvidorsalis Hbn.—Thunbergia alata (Fauna, Lep. Ceyl.).

Phryganodes Guen.
P. analis Snell.—Cassia fistula (mihi).

Dichocrocis Led.

D. punctiferalis Guen.—Mango flowers, Castor, Garuga pinnata fruits, Cacao (Lefroy), unripe seeds of Castor (mihi) Guava, Castor, Mango (Trehan and Pingle, *Journ., Bomb. Nat. Hist. Soc.*, xlvi, 149).

Nacoleia Wlk.

N. vulgalis Guen.—Lucerne, Soya, Phaseolus radiatus (Lefroy).

N. diemenalis Guen.—Phaseolus mungo (Lefroy).

Botyodes Guen.

B. asialis Guen.—Ficus (Lep. Ceyl., Fauna).

Sylepta Hbn.

S. aerogata F.—Cotton (Trehan and Pingle, *Journ., Bomb. Nat. Hist. Soc.* xlvi, 144), Hollyhock and other Malvaceae (mihi).

S. lunalis Guen.—Grape vine (Lefroy).

Lygropia Led.

L. quaternalis Zell.—Sida rhombifolia (Lefroy).

Agathodes Guen.

A. ostentalis Hbn.—Erythrina indica (Lefroy).

Glyphodes Guen.

G. negatalis Wlk.—Ficus religiosa, Dillenia indica fruits (Lefroy).

G. vertumnalis Guen.—Tabernaemontana coronaria (Lefroy, mihi).

G. glauculalis Guen.—Tabernaemontana (Lep. Ceyl.)

G. unionalis Hbn.—Jasmine (mihi).

G. bivitralis Guen.—Ficus oppositifolia (Lep. Ceyl.), Ficus religiosa (mihi).

G. caesalis Wlk.—Ficus religiosa (mihi).

G. canthusalis Wlk.—Ficus religiosa (mihi).

G. sinuata F.—Moduca (Lep. Ceyl., Fauna).

G. indica Saund.—Cotton (Fauna), Cucurbitaceous plants (Lefroy).

Polythlipta Led.

P. divaricata Moore.—Phaseolus (Lep. Ceyl., Fauna).

Lepyrodes Guen.

L. neptis Cr.—Jasminum sambac (Lefroy, mihi).

L. geometralis Guen.—Jasminum sambac (Lefroy).

Leucinodes Guen.

L. orbonalis Guen.—In brinjal fruits (Fauna, Trehan & Pingle, *Journ., Bomb. Nat. Hist. Soc.*, xlvi, 147), in fruits of various Solanaceæ (mihi).

Crocidolomia Zell.

C. binotalis Zell.—Crucifers (Lefroy).

Hellula Guen.

H. undalis F.—Cabbage, Cauliflower (Lefroy).

Terastia Guen.

T. meticulosalis Guen.—In young stems of Erythrina (Fauna).

Isocentris Meyr.

I. opheltesalis Wlk.—Sunflower (Lefroy).

Crocidophora Led.

C. ptyophora Hamps.—Bamboo (mihi).

Maruca Wlk.

M. testulalis Geyer—Pulses (Lefroy).

Pachyzancla Meyr.

P. phoepteralis Wlk.—Anisomeles ovata (Lefroy), grasses (Cherian & George, *Journ., Bomb. Nat. Hist. Soc.*, xxxi, 530).

P. aegrotalis Zell.—Croton, Schizandra, Alternanthera (Lefroy).

Phlyctaenodes Guen.

P. nudalis Hbn.—Croton, Fenugreek (Lefroy).

Antigastra Led.

A. catalaunalis Dup.—Sesamum (Lefroy, Trehan & Pingle, *Journ., Bomb. Nat. Hist. Soc.*, xlvi, 149).

Noorda Wlk.
N. blitealis Wlk.—Moringa pterygosperma (Lefroy).

Metasia Guen.
M. coniotalis Hamps.—Sweet potato tubers (Lefroy).

Pionea Guen.
P. ferrugalis Hbn.—Cabbage, Blumea balsamifera (Lefroy).

Pyrausta Schrank.
P. machoeralis Wlk.—Teak (Fauna).
P. incoloralis Guen.—Calotropis gigantea (mihi).
P. coclesalis Wlk.—Bamboo (Fauna), occasionally on Maize (Lefroy).
P. bambucivora Moore—Bamboo (Fauna).
P. salentialis Snell.—Boring in stems of Polygonum (Lefroy).

I have, in addition, the following record, but the species does not appear in the Fauna and I am not sure of its actual affinities.

Phostria piasnsalis Wlk.—Coleus parviflora (Aiyar, *Journ.*, *Bomb. Nat. Hist. Soc.*, xl, 336).

THE BUTTERFLIES OF THE KHASIA AND JAINTIA HILLS, ASSAM

BY

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AND

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Since the publication of Swinhoe's list in 1893 we have not been able to trace any detailed list of butterflies from the Khasia and Jaintia Hills in Assam and the present list is intended to assist collectors in giving as precise information as possible with regard to localities.

The high plateau of the Khasia and Jaintia Hills is almost bare of trees save scattered pines. The forests are on the lower hills. They commence at Umran, 21 miles from Shillong, called the 42nd Mile since miles are reckoned from Gauhati on the Gauhati Road (G. S. Road). Good localities are Mile 40 near the Margaret Falls; Mile 36 near Umsaw Nongkharai Village; the path into the forests at Mile 33; another such path at Mile 36; Nongpoh Inspection Bungalow at Mile 30; Umling forest path at Mile 23; Burnihat Inspection Bungalow and the path leading up the river from it at Mile 16.

Shillong 5,000 ft., Umran 2,300 ft., Nongpoh 1,760 ft., Burnihat plains level.

No advantage has been found from penetration into the woods elsewhere. The villages are few and the whole region is very malarious in the monsoon.

The other wooded area is to the south on the slopes towards Sylhet District, extending from the Garo Hills border on the west to the North Cachar Hills on the east. There are many villages growing oranges, areca nuts, bag leaf trees and pan vines; but travel is difficult except for the district officers, as there are no rest houses and porters are needed. The only areas accessible are those beside the Shillong-Sylhet motor road and that below Cherrapunjee.

Along the Shillong-Sylhet road are the Laitlyngkot Inspection Bungalow, 6,000 ft., 17 miles from Shillong where *Argynnis rudra* is found; Pynursla Inspection Bungalow 4,900 ft., 30 miles from Shillong where *Meandrusa gyas gyas, Meandrusa evan, Appias lalage lalage* and *Aporia agathon agathon* occur in the small woods behind the bungalow; Poontoong, 40 miles from Shillong where *Leptocircus curius* is found at the bridge; the wooded area onwards to Dawki and finally the villages Darrang and Shnongpedeng reached by boat or on foot within 2 miles of Dawki and called simply Dawki in this list, for brevity. There is a bungalow at Dawki and the place is excellent, yielding uncommon species.

The area below Cherrapunjee has always been noted but Mawsmai where the motor road ends, 3 miles below Cherrapunjee bungalow, is also excellent. Further on one must walk 2 miles down to the woods at Mahadei (Laitera). An arrangement to stay in a Khasi village house there would save much tramping. There is an inspection bungalow at the foot of the hills at Therria. On the south-west, a Welsh Mission bungalow at Laitkynsew could be occupied by permission as a centre, but a daily steep climb up and down to the best localities below the bungalow is required. Another route is from Cherrapunjee bungalow eastwards across the plateau 2 miles to Kut Madan by cycle and from there a steep path goes down through woods from where one can return on the same day. In the precipitous gorge of the Umiam, west of Cherrapunjee the Khasi collectors in the villages of Mawphu and Thiedding produce rarities for a dealer but the woods are not swarming with butterflies as one of us found, who had to stay there on duty for a week in June and saw nothing even on days where there was no rain, and the rainfall in Cherrapunjee area is the heaviest in the world, upwards of 400 inches. Trips may be entirely fruitless, as there may be no sunshine for days together.

There are no species on the high plateau not obtainable near the motor roads, Shillong-Cherrapunjee or Shillong-Mawphlang, so journeys into the interior of the plateau are of no benefit.

The high plateau of the Jaintia Hills (Jowai sub-division) is a poor place as trees are mostly planted blocks of pines. The southern slopes towards Sylhet District are of course as good as the Cherrapunjee area; but the only accessible place is Syndai Inspection Bungalow, 2,500 ft., 6 miles from Jaintiapur Inspection bungalow which is on the 60th mile of the Shillong-Sylhet road. The path below Syndai is a prolific place especially for the genus *Euthalia*. Porters are needed.

The Khasi Hills are so frequently mentioned by authors that the reader might have an idea that butterflies were to be seen in swarms and rare ones at that. The idea would be entirely wrong.

One of us was for many years a District Officer in the Khasia and Jaintia Hills but touring mostly on the high plateau in the cold weather, had small opportunity of collecting. In the villages on the steep slopes towards Sylhet or in the forests towards Gauhati little was seen on winter tours. Everything collected was during the march or a spare hour around the camp. After retirement recently more time has been available.

The other of us was Superintendent of Police whose duties took him along the main roads and spare hours, though infrequent, yielded more than the long journeys into the interior of the District Officer. In recent months a few days have been available.

Some purchases were made from professional collectors when this list was contemplated and from the old stock of the Himalayan Butterfly Stores, Riatsamthiah, Shillong (proprietor Mr. Sircar). His export business, suspended in the war, began again in early 1947. The butterflies were examined only after the printing of proofs of this article and final changes made are mostly indicated by 'Produced from below Cherra' or 'From below Cherra'. The months and places S., S.W. or S.E. of Cherrapoonji are unknown. Mr. Sircar's men collect entirely from this area and obtain species, often in some quantity, seldom or never seen by the amateur elsewhere.

The nomenclature and numerical order of arrangement follow that in Evan's Identification of Indian Butterflies, our incentive and guide. The illustrations of every species in Antram are most helpful. We have had the luck to procure for ourselves all the standard works including Seitz but the visitor can consult Marshall and de Niceville, Bingham and Evans partly in the Public Library and partly in the Shillong Club. We were unable to visit museums.

The months given against species are merely those in which we saw them.

A list of Lycaenidae is ready and will be published later.

A1. *Troides helena cerberus,* Fd.

This species is common at Dawki. There are spring and autumn broods. Females of Var. *eumagos* Jord. are more often seen than the typical form of the female. It has been noticed in Shillong on several occasions but is not common above 3,000 feet.

Troides aeacus Fd.

This is more frequent on the Gauhati-Shillong Road than on the slopes to Sylhet and has not yet been noted at Dawki.

A2. *Byasa aidoneus* Db.

The headquarters of this very rare butterfly appear to be the Gauhati-Shillong Road. The best locality appears to be the stretch of jungle between the road and the river on the outside of the big curve just beyond Mile 41 in the Gauhati direction. Here this species flies amongst the tree trunks up to about 3 p.m. in almost any weather. A long handled net is very necessary as it flies about 14-15 ft. above the ground. There are other localities also; the best being on the west of the road at Umran Nong Kharai. The former locality is best in the middle of July; the latter in October and it appears therefore that there are two broods. It is very difficult to distinguish this species on the wing, from the next, and hence it is possible that many are missed by collectors.

Byasa varuna astorion Wd.

This is very common on the plains all over Assam but is inclined to be local. In our area it occurs below Cherrapunjee, at Margaret Falls and Burnihat in small numbers; but is quite common at Umran Nong Kharai where it flies with *aidoneus.* It flies more or less continuously from May until late in the autumn.

Byasa coon cacharensis But.

Taken at Umsaw Nong Kharai in October. Seen at Syndai. Very rare. It occurs commonly in the Garo Hills and in the North Cachar Hills on both sides of the south Khasi Hills.

Byasa aristolochiae aristolochiae F.

Common in forest areas at all times and in some years appears in considerable numbers in Shillong itself. Var *dphilus* Esp. also occurs.

Byasa latreillei kabrua Tyt.

Has been obtained in large numbers from professionals in the Naga Hills east of our area but not in the Khasi Hills. They are not high enough.

Byasa nevilli WM.

One specimen obtained from a professional; taken below Cherrapunjee. Very rare.

Byasa philoxenus polycuctes Db.

Taken below Cherra in spring and autumn. Occasionally seen on Lantana just above Burrapani. Not common.

Byasa dasarada dasarada M.

One taken at Cherrapunjee and another at Umsaw Nong Kharai in October. Occurs also at Syndai in the Jowai subdivision of the Khasi Hills. Taken by professionals below Cherrapunjee.

Byasa crassipes Ob.

One specimen has been obtained by us in the Sadiya Frontier Tract and others in Manipur by General Tytler. There would appear to be no valid reason why it should not turn up in the Jowai subdivision of the Khasi Hills.

Chilasa agestor agestor Gray.

Not rare. Many obtained from professionals, taken below Cherra.

Chilasa slateri slateri Hew.

Rare. Single brooded. In March-April at Dawki. Produced in some numbers from below Cherra. Female very rare.

Chilasa epicydes epicydes Hew.

Rare. Some produced from below Cherra, e.g. Nongpriang early Oct.

Chilasa paradoxa telearchus Hew.

Rare; but occurs in some numbers at Dawki in March and again in July and October and below Cherrapunjee in September and October, so it is at least double brooded although Seitz states it is single brooded.

Var. *danisepa*. But is very rare but is found at Mawphu in the Umiew river gorge west of Cherra and is said to be fairly common at Thiedding village.

Chilasa clytia clytia L.

Var. *dissimilis* is the common form, clytia clytia (the dark form) is much rarer. Obtainable both below Cherra and on the Gauhati-Shillong road in March to June and in the autumn. Very common at Dawki where specimens of var. *dissimillima* Evans, have also been obtained.

A4 *Papilio memnon agenor* L.

Common in the forest areas of the Khasi Hills and also all over the plains districts of Assam throughout the monsoon. Occurs in Shillong. All three forms of the female are found but are not rare. Some striking forms of the female var. *alcanor* Cr. have been noted including one in which the discal white spots on the hind wings have been almost completely dusted over with red scales. It is an easy species to breed and the larvae are often numerous on lemon and orange trees.

Papilio bootes bootes Wd.

Rare, taken in the gorges below Cherrapunjee, e.g. Mawphu by professional collectors.

Papilio rhetenor Wd.

Fairly common at Pynursla and Dawki, obtainable at Umsaw Nong Kharai, on the Gauhati-Shillong Road; at and below Cherrapunjee. Females, easily distinguishable by the peculiar shape of the hindwing, are rare but one or two can generally be found round the solitary lime tree in the Pynursla Inspection Bungalow compound. Numerous larvae have been obtained from this tree and a good series bred out. The dry season form is very noticeably smaller than the wet season form. The species occurs on the plains of Assam, e.g. in the forest areas bordering the Naga Hills in Golaghat, throughout the monsoon and in the autumn.

Papilio protenor euprotenor Fruh.

Common in the same localities as *memnon,* e.g. on the Gauhati-Shillong road, Umsaw Nong Kharai down to Burnihat throughout the monsoon. The larvae have frequently turned up on citrus in the Government Experimental Station at Burnihat and has frequently been bred by us from larvae found at the back of Kench's Trace in Shillong on *Xanthoxylum acanthopodium.* The females are rare.

Papilio elephenor elephenor Db.

Professional collectors have taken this species from the gorges below Cherrapunjee in May but we have not seen any in their hands. It is said to be single brooded and flies only for about three weeks.

Papilio polyctor ganesa M.

Common in the forest areas throughout the monsoon. It is not by any means rare in Shillong and we have bred a very long series from eggs and larvae found on *Xanthoxylum acanthopodium* at the back of Kench's Trace in Shillong. Included in this series is a fine variety of the female with a complete set of red lunules on the upper hindwings. We also have a male which is little bigger than a Cabbage White. The larvae are exceeding easy to rear if kept in ordinary glass jam jars provided not more than three are placed in each jar.

Papilio paris paris L.

Common in the same areas as *ganesa* but less so in Shillong. At least one specimen has been bred by us from amongst *ganesa* larvae found on *Xanthoxylum acanthopodium* at Kench's Trace in Shillong. The dry season form is very small compared with the wet season form and pygmies are not rare. A very fine series can generally be obtained in March on wet sand below Darang village on the Dawki River.

Papilio arcturus arcturus Wd.

Not nearly so common as either *ganesa* or *paris* and is not found low down. It prefers the oak woods in the Cherrapunjee and Pynursla areas where it is not very rare, but it is difficult to obtain as it flies high. Professional Cherrapunjee collectors however obtain many fine specimens including the rare females with long handled nets. It is found throughout the monsoon. Also Shillong.

Papilio krishna M.

Not seen by us in the Khasi Hills but taken by Mr. Perry, S.D.O. in the Cachar Hills to the east of our area.

Papilio castor castor Wd.

Rather rare but can generally be obtained on wet sand along the Dawki River below Darrang and Snongpedeng villages in April and in October and also Umling on the Gauhati-Shillong Road between Nonghoh and Burnihat. The females are very rare but we have obtained two at Mawsmai near Cherrapunjee in thick jungle; and one at Dawki in April. They are however quite common on lantana below the waterworks at Gauhati in the Kamrup District.

Papilio helenus helenus L.

Common in forest areas in Shillong from May throughout the monsoon. Very common and in fine condition on the Dawki river sandbanks. Larvae common on lemon and orange low down and on *Xanthoxylum scanthopodjum* at Kench's Trace in Shillong.

Papilio chaon chaon Wd.

Common from Umsaw Nong Kharai to plains level on the Gauhati-Shillong road and at Dawki throughout the monsoon in the same areas as *helenus* but is rarer. It occasionally turns up in Shillong and is sometimes seen in plains villages, e.g. Silghat in Nowgong District. The dry season form is not so noticeably smaller than the wet season form as is the case with *helenus*. It is plentiful in heavy forest areas in Upper Assam but is rarely seen in open country in the plains.

Papilio polytes romulus Cr.

Very common at all times and all over Assam. All three forms of the female have been noted, but var. *stichius* F. is by far the most common. The typical form of the female and var. *cyrus* F. are both rare. Intermediate forms between the typical and var. ***stichius*** have been noted and a fine series of forms would not be difficult to obtain and would at the same time be most interesting to illustrate the transition from the typical form to var. *stichrus*. The larvae feed on a small aromatic shrub which is extensively used in Assam and elsewhere as a flavouring for curries.

Papilio demoleus demoleus L.

Very common indeed at low levels in orange and lemon groves on which the larvae feed at Burnihat and on the Sylhet slopes of the hills. It is very common all over Assam and interesting varieties sometimes turn up. It is very easy to rear from egg or larva. There is a difference of coloration in some specimens in which the usual clear yellow is suffused with a dark brownish tinge. Careful examination has shown however that this coloration is never found in fresh specimens and must be put down to staining due to age or other causes. Such specimens are invariably ragged and worn. They are most certainly not varieties nor can they be said to represent a separate species or subspecies.

Papilio machaon verityi Fruh.

Not seen by us in the Khasi Hills but it is known to occur at Suroi in Manipur and is almost certainly to be found in the Naga Hills but is unlikely to turn up in the Khasi Hills unless it is introduced and establishes itself on carrot in the extensive market gardens in Shillong.

A5. *Pathysa eurous sikkimica* Heron.

Taken at Umtyngar gate, 14 miles from Shillong, on the Shillong-Sylhet Road. It is not rare at Laitlyngkot in the valley of the small stream below the Inspection Bungalow but is difficult to secure owing to the speed at which it flies.

As with all Pathysa, females are very rare.

Pathysa agetes agetes Wd.

Not rare on wet sand at Dawki in the area of Darrang village but numbers vary very considerably from year to year.

Pathysa aristeus anticrates Db.

One obtained on wet sand at Darrang village on the Dawki River in April and one at plains level below Cherrapunjee, also in April.

Pathysa antiphates pompilius F.

Common in the low hills along the Gauhati-Shillong Road and is numerous at Dawki along the river on wet sand in March and April; available below Cherrapunjee at plains level throughout the monsoon.

A6. *Zetides cloanthus* Wd.

Found occasionally in Shillong in April. Is fairly common on the top of the Peak and on lantana blossom well above Kench's Trace. Is taken by professional collectors in some numbers in the Cherrapunjee area but is rarely seen below 3,000 ft. It flies high round the tops of oak trees and is difficult to secure except with a net having at least a 12 foot handle. It appears to be rare, but this is due to its habits and is actually fairly common. Mr. Perry reports it to be rare in the north Cachar Hills which is a very fine collecting ground. We have noticed it to be very common on Birch Hill in Darjeeling.

Zetides sarpedon sarpedon L.

Zetides doson axion Ed.

Both are very common along the river at Dawki on wet sand in March and April and from Umsaw Nong Kharai to Burnihat on the Gauhati-Shillong Road in spring and autumn.

Zetides eurypylus cheronus Fruh.

Not common like *doson*. In same places.

Zetides bathycles chiron Wall.

On wet sand along the river at Dawki in April but is not common.

Zetides agammemnon agammemnon L.

Not scarce on wet sand along the river at Dawki in April and obtainable on lantana blossom on the Gauhati-Shillong Road, but not often seen. It appears to be commoner in the Golaghat forest areas towards the Naga Hills than in the Khasi Hills. Syndai in our area is, however, a good locality, in October.

A7 *Paranticopsis macareus lioneli* Fruh.

The males are common along the river at Dawki in March and April. No females have been taken.

Paranticopsis xenocles xenocles Db.

Less common than lioneli but obtainable in fair numbers along with that species at Dawki in April and occasionally at Burnihat along the Umran River in May and June. Only two females have been obtained, both from the area below Cherrapunjee in dense forest. Many produced from below Cherra.

Paranticopsis megarus megarus Wd.

Common at Dawki along the river in April 1940 but not seen there since. One obtained from a professional probably from the area below Cherrapunjee in May. Only one female was taken, to the North of the District in 1939.

A8 *Meandrusa gyas gyas* Wd.

Many seen near the Pynursla Inspection bungalow in April, but keeps to the tops of oak trees requiring a net with a very long handle. One taken in April in Jirang State in low hills on the Kamrup border. Professionals catch them in large numbers including a few of the rare females, in the Cherrapunjee area. We have not seen it on the plains; but the late Mr. Deeks took it at Mariani, near the railway station, in Upper Assam.

Meandrusa payeni evan Db.

At Umsaw Nong Kharai on the Gauhati-Shillong Road in April. Settles on plants of Lady's Fingers (*Hibiscus esculenta*). Many have been seen on grassy slopes at Poontoong. Taken in April at Lawbah on the slopes towards Sylhet. Professionals take many in the area below Cherra. The females are very rare.

A9 *Teinopalpus imperialis imperialis* Hope.

Obtainable at Laitryngew and Laitlyngdoh and neighbourhood on the Cherrapunjee Road on fine days in May and early June especially on the bare tops of the hills which have trees on their lower slopes. They fly from dawn till

10 o'clock after which they retire to tree tops. Males occasionally settle on stones and are easily taken, females are rather rare.

The Khasi Hills variety is a new subspecies which has not yet been described.

As this butterfly is confined only to a particular area in the Khasi Hills, it provides an export business for professionals, who may cause its extinction.

A10 *Leptocircus curius* F.

Found at Poontoong on the Shillong-Sylhet road and obtained by professionals in numbers towards Sylhet below Cherrapunjee. We have taken one or two at Syndai in October. Taken by Mr. Delanougerede at Umsaw Nong Kharai (Mile 36) on the Gauhati-Shillong road. It is rare and very local. Mr. Perry saw it at only one place in the North Cachar Hills. One of us saw it in large numbers in the Ghildarri Forest Reserve at plains level near Golaghat in the Sibsagar District in early October.

Leptocircus meges, with its green band, has only been taken by us in the Naga Hills. It does not occur in the Khasi Hills.

A11. *Armandia lidderdalei* Atk.

Does not occur in the Khasi Hills. Taken by us only in the Naga Hills in June. Kirbari in the Naga Hills in June is an excellent locality.

PIERIDAE

B1. *Leptosia nina nina* F.

Very common in the orange groves at Dawki, upstream from Darrang village, throughout the monsoon. Some are very small indeed. Easily mistaken for a moth as it flutters in low herbage. Noticed also at low levels on the Gauhati-Shillong road.

B4 *Pieris napi montana* Ver.

Pieris canidia indica Evans.

Pieris brassicae L.

All these are common in Shillong and other parts of the district from April onwards.

Brassicae is a pest in market gardens. It is curious however that it is common at Sylhet, in Sylhet district, to the south of the Khasi Hills but has not been noticed at Gauhati, in Kamrup district north of the Khasi Hills. Although General Tytler reported its presence in considerable numbers in Manipur, it is unknown in Lakhimpur district. Members of the cabbage family are widely cultivated in all these areas and this somewhat curious density of distribution is remarkable. Easy to breed but may be parasitised.

Evans in his 'Identification of Indian Butterflies' has stated that the female of *Pieris napi montana* is 'yellow and often much darkened'. This is, however, not correct so far as the Khasi Hills are concerned, at least. We have dark females as well as many lightly marked specimens but have never met with a yellow female amongst the many hundreds we have examined.

B5. *Aporia agathon agathon* Gray.

In Shillong in May and June and Pynursla in oak woods on the Shillong-Sylhet road in April. Not rare.

B6. *Delias agostina* Hew.

Not rare on wild blossom at Mile 45 on the Gauhati-Shillong road at the end of November including many fine dark females. It is usually hard to get as it keeps to the tree tops.

Delias hyparete hierte Hub.

Not common. A few in the same locality as *agostina*; also from Cherra.

Delias belladona lugens Jord.

Not rare on the Peak in April and June and again towards the end of the monsoon on *Buddlea* blossom.

Delias berinda berinda M.

A few are generally to be obtained round the Inspection Bungalow at Jowai in June.

Delias descombesi leucacantha Fruh.

Common all over the district, particularly at Mile 45 on the Gauhati-Shillong road on wild blossom in November.

Delias aglaia L.

Common all over the district except on the high treeless plateau.

Delias thysbe pyramus Wall.

Not rare on wild blossom at Mile 40 and 45 on the Gauhati-Shillong road and elsewhere in November. Can be confused with *aglaia* in fight. It has also been taken at Syndai in October.

B7. *Prioneris thestylis* Db.

Taken at Dawki on wet sand. Occasional specimens are to be found all over the district except on the high treeless plateau throughout the monsoon. Specimens in fine condition including the rare females are not rare on *Buddlea* blossom along the Shillong-Sylhet road in the Mile 21 area and towards Pynursla in October and November. Plentiful at Nongpriang below Cherra, September.

Prioneris clemanthe Db.

Very rare but we have obtained this species on wet sand upstream from Dawki in October and November. It has also been noted in lots from professionals who have obtained it below Cherrapunjee.

B9 *Huphina nerissa phryne* Fruh.

Huphina nadina nadina Luc.

Dawki upstream along the river. The latter is the commoner of the two species. The males are met with on wet sand and an occasional female is to be found on lantana at somewhat higher levels. It has been taken in Shillong in August and at Syndai.

B10. *Appias lalage lalage* Db.

Common on wet sand along the river above Dawki in March and April. Not rare in Shillong during the monsoon where many fine examples of the female are obtainable. In late October and November a good series can be obtained on *Buddlea* on the Shillong-Sylhet road between Mile 21 and Pynursla. A number of specimens with yellow on the underside of the hindwing have been noted. This form is not noted by Evans in his 'Identification of Indian Butterflies'.

Appias indra indra M.

Occasional specimens can be picked up from amongst droves of lalage sipping wet sand along the river above Dawki. We have also recorded it below Syndai in October.

Appias libythea olferna Swin.

Is very uncommon but we have one specimen taken in Shillong in June and another at Dawki in March. Specimens of both males and females have however been obtained by us at Burnihat near the bridge in early June.

Appias lyncida hippoides M.

The male is very common everywhere along rivers and also comes as high as Cherrapunjee. Fond of wet sand. The female is not uncommon in the orange groves at Dawki.

Appias albina darada Fd.

Somewhat scarce but a few can generally be obtained while sitting on wet sand on the river bank above Dawki in company with *lalage* and *hippoides.* It comes as high as Cherrapunjee in large numbers in October to blossom. A number of females, which are very rare, have been obtained in Shillong and also at Cherrapunjee.

Appias nero galba Wall.

The dealer, Shillong, got very rarely from Cherra in past years. We took one at Piphima, Naga Hills. Lt.-Col. Betts saw a number at Lumding, Nowgong district, in September.

B11 *Catopsilia crocale* Cr.

Common towards Kamrup. The female is very variable and some interesting varieties have been obtained through breeding large numbers of larvae, which sometimes completely defoliate *Cassia* trees. One of these varieties corresponds almost exactly to a form usually found in the Phillippines.

Catopsilia pomona F.

Common towards Kamrup but rare towards Sylhet.

Catopsilia pyranthe mina, Herbst.

Catopsilia florella gnoma F.

Not rare at plains level on the Sylhet side of the Hills. Not so common towards Kamrup.

B12 *Gandaca harina assamica* M.

At Burnihat and Nongpoh on the Gauhati road in April; also on the river upstream from Dawki in March and April and again in the autumn. Fond of sitting on wet sand and near puddles in the jungle. The white female is not common. It is also available at Syndai.

B13. *Dercas verhuli doubledayi* M.

Rare. A few were taken on the Gauhati-Shillong road in September. A few obtained from Cherrapunjee professional collectors and caught by them low down below Cherrapunjee. It is much more common in Sikkim and along the Kobo-Pasight road on the N.E. Frontier of Assam.

Dercas lycorias Db.

Several specimens taken at Laitlyngkot 6,000 ft. in June and July and also on the Causeway along the Shillong-Sylhet road. A few specimens obtained at Mawsmai near Cherrapunjee in early March. A number were obtained from Cherrapunjee professional collectors. It is very easy to mistake this species on the wing for a common *Terias* and great care is necessary to avoid missing this species as a result of this similarity. It is not common.

B15. *Terias libythea* F.

Terias laeta laeta Bdv.

Terias blanda silhetana Wall.

Terias hecabe hecabe L.

The first two and the last are very common in Shillong and all over the high plateau, also at low levels.

Silhetana is the prevailing form at Dawki in autumn.

With regard to *silhetana,* we have obtained this at Dawki in December, but is probably much more widely distributed throughout the monsoon at low levels.

B16. *Colias croceus fieldii* Men.

Is common on the Peak at Shillong and at Laitlyngkot. It is found also in Shillong itself and at Mawflang but is not so numerous at the latter place. The larvae feed on a small blueflowered vetch-like plant but females in confinement lay freely on clover. We have secured one white female of this species.

B17. *Ixias pyrene pirenassa* Wall.

Is found in Shillong occasionally but is mostly seen at low levels on the road to Gauhati and the slopes towards Sylhet. Good specimens of the female are hard to obtain.

B18. *Hebomoia glaucippe glaucippe* L.

Occurs in the river gorges leading to the Sylhet plains and at low levels on the road to Gauhati throughout the rains. Many good specimens can be obtained during the late monsoon on wild balsam in the orange groves near Dawki.

B20. *Pareronia avatar avatar* M.

We have obtained one specimen of this butterfly, rare in Assam, at Gauhati in Kamrup district on lantana flowers and there is therefore no reason why it should not also occur in the low hills of our area to the north along the Kamrup border. Not on Sylhet side. Mr. Perry took it in Garo Hills.

DANAIDAE

C2. *Danais aglea melanoides* M.

Common all over the district.

Danais tytia tytia Gray.

Common all over the district above 3,500 feet. It is plentiful at Cherrapunjee and along the road to Sylhet between Mile 21 and Pynursla. Some interesting varieties have been obtained at Laitlyngkot, a few of which are indistinguishable from the subspecies *sita,* Koll and others show the complete transition from *sita* to the true *tytia.*

Danais limniace mutina Fruh.

Danais melissa septentrionis But.

Both occur all over the district but *mutina* is rarer.

Danais melaneus plateniston Fruh.

Is found in the same localities as *tytia* but is rarer and also occurs lower down in the hills.

Danais plexippus L.

Very common all over the district, particularly in the Dawki area where many fine specimens are available in a reed bed below Darrang village.

Danais chrysippus L.

Common all over the district but is not so often met with as *plexippus.*

C3. *Euploea mulciber mulciber* Cr.

Very common all over the district. Also found in Shillong. We have some very small examples of the female.

Euploea core vermiculata But.

Common at low levels. The larvae feed on oleander.

Euploea alcathoe doubledayi Fd.

Numerous at Syndai, October. Also from below Cherra. Scarce elsewhere.

Euploea deione deione Wd.

Fairly common on sandbanks at Dawki and at mile 40 G. S. road.

Euploea harrisi hopei Fd.

Not rare. Dawki sandbanks; below Cherra; G. S. road.

Euploea diocletiana diocletiana F.

Common in forest areas below high plateau, especially at Margaret Falls on G.S. road where it sits on tarmac. We have not distinguished *ramsayi.*

Euploea klugii macclellandi M.

Somewhat rare. Below Syndai April and October and at Dawki and from below Cherra.

Euploea midamus splendens But.

It is said to occur fairly plentifully here but we have obtained only one at Dawki in August. *N.B.*—We have seen one *Euploea* not blue glossed and almost certainly ***Euploea crassa crassa*** flying over sand below Darrang village near Dawki, but as we failed to take it we cannot state the occurrence of this species here.

SATYRIDAE

D*1*. *Mycalesis anaxias aemata* Fruh.

A few to be found in orange groves on the river near Dowki in October (worn). Below Syndai and rarely produced from below Cherra. Not seen elsewhere.

Mycalesis francisca sanatana M.

A few obtained at low levels. At Umran mile 42 G.S. road 2,300 feet October.

Mycalesis persius blasius F.

Taken on plains Upper Assam (Jorhat) but search for it here has so far been unsuccessful.

Mycalesis mineus mineus L.

Very common at all levels.

Mycalesis visala visala M.

Probably uncommon. Our specimens are few. *Khasia khasia* must occur here but we have no specimen.

Mycalesis malsara M.

One at Syndai in October. The dealer says rarely taken below Cherra. We got at Piphima, Naga Hills, 3,000 feet, October.

Mycalesis malsarida But.

Not rare at Dawki in October. Also from below Cherra. One at Mile 35 G.S. road. Seems scarce.

Mycalesis mestra mestra Hew.

Produced by professionals from Cherra. Rare.

Misenus and *nicotia* are recorded by Bingham from the Khasi Hills.

D3. *Lethe sidonis sidonis* Hew.

We have a long series of this species from various portions of the high plateau including Shillong, particularly from the valley of the small stream below Laitlyngkot Inspection Bungalow. We have referred the specimens to the above but it is virtually certain that they belong to a new and undescribed sub-species in view of the fact that all the ocelli below are disintegrated in all specimens, whereas this is not so in *sidonis* from Darjeeling.

Lethe sura Db.

We have obtained several specimens in various parts of the district, most of them on the Shillong-Sylhet road between Laitlyngkot and Pynursla where it is at times not uncommon but flies high, seldom settles and is therefore difficult to secure.

Lethe europa niladana Fruh.

At low levels. Not rare but seldom seen in the jungle.

Lethe rohria rohria F.

In Shillong gardens, at Barapani below Shillong, Dawki, Burnihat and Nongpoh.

Lethe confusa gambara Fruh.

Common at low levels Assam Valley and Sylhet sides.

Lethe verma sintica Fruh.

Common in Shillong from April onwards and on high plateau.

Lethe insana dinarbas Hew.

Rare. It flies high round the tops of oak trees, e.g. round the Inspection Bungalow, Pynursla. Also from Cherra.

Lethe latiaris Hew.

Rare. In woods near Mawsmai below Cherra. At mile 40 G.-S. road November and taken in Shillong.

Mekara zuchara Fruh.

Not rare. Nongpoh, Burnihat, Dawki, Syndai. May to October.

Lethe chandica flanona Fruh.

Burnihat in April and two from below Cherra. Scarce.

Lethe kansa M.

Not rare. Nongpoh in May, Syndai in October, on slopes to Sylhet 2,000 feet. April and from below Cherra.

Lethe sinorix Hew.

Not rare on Sylhet road between mile 21 and Pynursla. Also in wood beyond Mawsmai below Cherra.

Lethe pulaha pulahoides M.

Recorded by Bingham from here.

Lethe bhadra M.

The dealer says he gets from Cherra very rarely.

Lethe yama yamoides M.

Not rare at Mawphlong 17 miles from Shillong in May. At Shillong April—May and Shillong peak and Laitlyngkot, 6,000 feet.

D5. *Orinoma damaris* Gray.

Common at Mawsmai, near Cherrapunjee, chiefly in the autumn. It is met with above 4,000 feet sparingly in most oak woods but not in the open.

D12. *Erebia annada orixa* M.

Very common on the Cherrapunjee road and on the road to Sylhet between Laitlyngkot and Mile 26 during the monsoon. We have obtained a long and fine series.

D14. *Ypthima baldus baldus* F.

Very common, particularly at low levels.

Ypthima hubneri hubneri Kirby.

Ypthima sakra austeni M.

Common high plateau and Shillong. *Hubneri* on plains also.

Ypthima nareda newara M.

Ypthima lycus lycus deN.

In Shillong and over high plateau. *Newara* also on Upper Assam plains, e.g. Lumding. *Lycus* is peculiar to these hills. The male differs from *newara* in having, like *baldus,* a patch both sides median vein. To detect this needs close scrutiny.

Ypthima methora methora Hew.

At Dawki in October and a few from below Cherra. Seems rare.

D15. *Zipoetis scylax* Hew.

Rare. One at Mile 36 G.-S. road in September; at Gauhati in April and several from below Cherra.

D16. *Orsotrioena medus medus* F.

Very common in forest areas below high plateau.

D18. *Ragadia crisilda crisilda* Hew.

In a wood west of the road beyond Mawsmai below Cherra. In dense shade at Mile 39 G.-S. road in October. Produced from below Cherra in some numbers. One at Dawki November. Not seen elsewhere.

D20. *Neorina patria westwoodi* M.

We have obtained numerous specimens from Shadwell's Wood at Cherrapunjee in September. It is a common species in the hands of Cherrapunjee professional collectors.

D21. *Anadebis himachala* M.

Not rare low down in the orange groves near Dawki and in the valley of the Umran river south of Burnihat on the Gauhati-Shillong Road. It is also to be found in woods at Syndai and at Miles 36-40 on the Gauhati-Shillong road.

D22. *Melanitis leda ismene* Cr.

Very common at low altitudes, becoming rarer as the altitude increases; but is available in Shillong. The wet season form does not apparently occur at all above 4,000 feet, where the ordinary dry season form occurs during the monsoon.

Melanitis phedima bela M.

Taken at Elephant Falls above Shillong and at Cherrapunjee, particularly in the neighbourhood of Mawsmai. Careful search will generally result in seven or eight being obtained each season.

Melanitis zitenius zitenius Herbst.

Not rare in the area of miles 36-40 on the road to Gauhati and has also been secured by us in the Mawsmai woods near Cherrapunjee, and at Syndai in October.

D25. *Elymnias hypermnestra undularis* Drury.

Very common at low levels, particularly in the orange groves near Dawki but good specimens of the female are rare. It is also difficult to avoid damaging them in the net as the wings of the female appear to be very brittle. Also common at Umling on the Gauhati Road.

Elymnias nesoea timandra Wall.

Not rare in the orange groves at Dawki in October and November. The food plant appears to be the areca nut which is also grown very extensively at Dawki. Also noted at Umling on the Shillong-Gauhati Road.

Elymnias malelas malelas Hew.

We have obtained it along the river above Dawki on the jungle paths and also at Umling on the way to Gauhati. It is common on the plains.

Elymnias patna patna Wd.

We have secured several specimens in the orange groves at Dawki and in the oak woods at Mawsmai near Cherrapunjee, but it is very seldom seen.

Elymnias vasudeva deva M.

Seen once in the orange groves at Dawki.

Elymnias penanga chelensis deN.

Antram records this as a rarity in the Khasi Hills but we have not seen it.

AMATHUSIIDAE.

E2. *Faunis arcesilaus* F.

Not rare in the undergrowth along the paths and streams in the orange groves upstream from Dawki and at Syndai in October.

Faunis eumeus assama Wd.

Not rare during the middle and late monsoon in the oak woods at Mawsmai near Cherrapunjee.

E4. *Sticopthalma camadeva nicevillei* Roth.

We have noticed enormous numbers in the hands of Cherrapunjee professional collectors who undoubtedly obtain this species low down below Cherrapunjee on the slopes towards Sylhet. We have ourselves secured this beautiful species in bamboo jungle on the banks of the Umran River just south of Burnihat on the road to Gauhati in June.

Sticopthalma sparta tytleri Roth.

Lt.-Col. Betts very kindly presented us with a specimen of this beautiful butterfly obtained by him near Haflong in the North Cachar Hills, so there would appear to be no reason why it should not occur in the east of the Jowai subdivision of the Khasi Hills towards Hot Springs.

E5. *Thaumantis diores* Db.

We have seen many specimens with professional Cherrapunjee collectors obtained from the borders of Sylhet. We have ourselves secured it in the orange groves at Dawki and at Margaret Falls on the road to Gauhati during the monsoon in June and again in November and also at Umling and Umsaw Nongkharai in thick forest in the evenings. It is common at Syndai, in the Jowai subdivision in October.

E8. *Amathuxidia amythaon* Db.

One only taken in the orange groves near Dawki. Very rare here. Most *Amathusiidae* come to over-ripe bananas hung up with skins partly removed.

E10. *Discophora tullia zal* Wd.

In all forest areas but seldom seen unless bait is used.

E11. *Enispe euthymius* Db.

Some are produced by professionals from the area below Cherra. At Mawdon State, 2,000 feet, S.W. of Cherra in April. At Mile 36 G.-S. road 1,900 feet. Rare.

Enispe cycnus cycnus Wd.

Mile 36 G.-S. road and one from Cherra area. Rare.

NYMPHALIDAE.

F1. *Charaxes polyxene hierax* Fd.

Also the varieties *hipponax* and *pleistoanax*. (Var. *khasianus* of *pleistoanax* has the discal band uphind slightly blue). Not rare in forest areas Assam and Sylhet sides and rarely in Shillong.

Charaxes aristogiton Fd.

Dowki March and November. Also rarely from below Cherra. Scarce.

Marmax Wd.

On G. S. road May and October. Also from below Cherra. Scarce.

Charaxes kahruba M.

Two produced from Nongpriang below Cherra early October. Rare.

Charaxes fabius sulphureus Roth.

Very rare here. One taken Nongpoh and one at Umsaw Nongkharai G.S. road. In Ghiladhari forest Golaghat, Upper Assam, October. Not rare along rail at Langting, N. Cachar Hills in October.

F2. *Eriboea schreiberi assamensis* Roth.

One got from a professional from the slopes to Sylhet.

Eriboea athamas athamas Db.

Common in forest areas down to plains. From March to end of year.

Eriboea arja Fd.

Flies with *athamas.*

Eriboea dolon magniplaga Fruh.

Eriboea delphis Db.

Both these rarities obtained by professionals below Cherra. The latter in the Mawphu area and in quantity. *Delphis* was seen by us in Ghiladhari forest, Golaghat, Upper Assam in October.

F7. *Apatura ambica ambica* Koll.

Is obtainable in fair numbers at Margaret Falls (Mile 40) on the Gauhati-Shillong road and on the Umran river in the same area from May till June and again in October. *Sordida* is recorded by Antram from the Khasi Hills, but we have not seen one.

Apatura parvata M.

This species is generally available between Mile 21 and Pynursla on the Sylhet road on fine hot days in September on the tarmac and is easily caught.

Apatura parisatis parisatis Wd.

Is met with fairly frequently at Dawki and at other places on the rivers where these emerge from the hills on the Sylhet side. Taken by us in August at Dawki and in October at Syndai. The female is rare.

F8. *Herona marathus marathus* Db.

One pair taken at Mawdon, 2,500 feet south-east of Cherrapunjee in April. One also seen at Poongtoong. Also noticed at Mile 36 on the Gauhati-Shillong road and taken at Burnihat plentifully and at Dawki in October.

F9. *Sephisa chandra* M.

Many males and one female obtained from Cherrapunjee professional collectors and a female was caught by us near Sohrarim on the Shillong-Cherrapunjee road in October. One male has also been taken in Shillong in June. A specimen was taken by another collector at Mile 36 on the Gauhati-Shillong road during the monsoon.

F10. *Euripus consimilis consimilis* Wd.

One obtained on the Umran river south of Burnihat in March.

Euripus halitherses Db.

We have obtained several males at Dawki in the spring and two forms of the female have been secured from Cherrapunjee professionals. Not uncommon on the Gauhati-Shillong road below Mile 40 in April and May and again in July. Females are rare but specimens of the two forms of the female have also been taken in the latter locality (Umran Nongkharai) by Mr. Delanougerede.

F11. *Diagora persimilis persimilis* Wd.

One from below Cherra, from the dealer. Rare.

F12. *Hestina nama* Db.

Fairly common near the 25th mile on the Sylhet road and at Cherrapunjee in the Circuit House compound in October. Also taken near the tea room at Nongpoh in June.

F15. *Penthema lisarda lisarda* Db.

We have obtained one specimen of this rare butterfly from a Cherrapunjee professional, one was taken by us at Nongpoh in August, another at Margaret Falls (Mile 40) on the Gauhati road in April and a third in August. It was also obtained near Haflong in the adjoining North Cachar Hills. One was sent to us this year from the Stillwell Road in N. Burma.

F16. *Dichorragia nesimachius* Bdv.

Nongpoh and Burnihat, June, August and autumn. At Dowki and from below Cherra. Uncommon.

F17. *Stibochiona nicea nicea* Gray.

In the low hills towards Kamrup (Jirang State) in April. We have also obtained it at Dawki where it is common during the rains, at times sitting low down on the trunks of orange trees. Common Syndai (October) and Cherra.

F18. *Euthalia lepidea lepidea* But.

The only common *Euthalia*. Plains and forest areas below plateau.

Euthalia julii adima M.

Fairly common at Dowki spring to autumn and below Cherra.

Euthalia julii sedeva M.

Ditto. Flies with *adima*.

Euthalia jahnu jahnu M.

Many worn females Dowki November but no male. Many females from Cherra in dealer's stock but only two males. Male very like *adima*.

Euthalia kesava kesava M.

Six males Dowki, August, November, and one female. One pair from Cherra.

Euthalia telchinia Men.

Two males and three females from below Cherra.

Euthalia garuda garuda M.

Two females Dowki, May and December. A pair from below Cherra.

Euthalia jama jama Fd.

Three at Dowki, November, and a few from below Cherra. One female.

Euthalia phemius Db. and Hew.

Fairly common in a small wood, Mawsmai below Cherra. Males sit on telegraph wires, females on oaks. A few produced yearly from Cherra.

Euthalia lubentina indica Fruh.

Males not rare, often sit on tarmac. Females very scarce and in dense jungle in small valleys. Both Assam and Sylhet sides.

Euthalia franciae rajah Fd.

We have taken it in fair number on oak trees in Cherra area, e.g. just below the control gate and just beyond Mawsmai. Professionals take in some quantity.

Euthalia duda Stg.

Several obtained from professionals taken below Cherra.

Euthalia sahadeva nadaka Fruh.

Not rare on slopes towards Sylhet. Taken in Shillong in June.

Euthalia iva M.

A perfect specimen of this extremely rare butterfly was caught by Lt.-Col. Betts just east of our area and is now in the senior author's collection. Mr. St. J. Perry took another in the North Cachar Hills. So it may occur in the eastern Jaintia Hills.

Euthalia evelina derma Koll.

Specimens of this beautiful butterfly have been obtained by us not only at Dawki in August, October and November, but also in the Valley of the Umran river, above Burnihat, on the Kamrup side.

Euthalia teuta teuta Db. & Wd.

This species has turned up fairly frequently from the slopes towards Sylhet and we have obtained several from professional collectors.

F19. *Adolias cyanipardus* But.

Many specimens seen and obtained at Dawki and Syndai on the Sylhet side in March, August and November and in the valley of the Umran River on the Kamrup side, and taken at Burnihat in June. The females are always damaged, due to the dense jungle in which they fly.

Adolias khasiana khasiana Sivin.

Many specimens obtained by professional collectors from the borders of Sylhet below Cherrapunjee. Taken by us Dowki, November. It has also been found in thick forest near Mile 36 on the Gauhati-Shillong road and at Nongpoh.

F20. *Parthenos sylvia gambrisius* F.

Common in open spaces and along the banks of the river at Dawki in March-April and again in October. It has also been seen sparingly on the Gauhati road. At least one specimen has come to notice in Shillong. It is very difficult to get good specimens. It is obtainable during the same periods at Syndai and below Cherrapunjee also.

F21. *Lebadea martha ismene* Db. & Hew.

Very common in the orange groves along the river upstream from Dawki and Syndai in April and more or less throughout the year. It is also to be found in the woods at Mawphlong in May but is rarely seen in Shillong. It is not found on the high treeless plateau.

F22. *Neurosigna doubledayi doubledayi* Wd.

Rare; we have caught and seen a few specimens on laurel blossom along the stream just beyond the Mawsmai near Cherrapunjee in September. Specimens have also been obtained in considerable numbers from professional collectors which they have taken on the slopes towards Sylhet. The females are very rare and seldom come down to ground level inside the dense jungle in the same vicinities as the males are found. The senior author has obtained two females in the little wood just beyond Mawsmai village near Cherrapunjee.

F24. *Limenitis austenia austenia* M.

Not actually taken by us but many specimens including one of the rare females have been obtained by us from professional collectors which they had obtained low down below Cherrapunjee. It is obtainable in the autumn also.

Limenitis zayla Db. & Hew.

Shillong in May but not seen elsewhere on the high plateau. Many specimens were obtained from Cherrapunjee professionals. It flies also in September and October. Rare.

Limenitis daraxa Db. & Hew.

Very common everywhere from 4,000 feet downwards throughout the summer. It is fond of sitting on roads and three or four can always be obtained on the tarmac at Margaret Falls on the Gauhati road and on the road near Mawsmai village close to Cherrapunjee.

Limenitis procris procris Cr.

Very common and is found along with and has the same habits as *daraxa*. It is also a filth eater. One of our specimens measures only 50 mm.

Limenitis dudu Wd.

One taken in March at Lawbah, 2,000 feet on the slopes to Sylhet, two specimens taken at the foot of the Peak, Shillong in August, one at Pynursla in October and three at Mawsmai near Cherrapunjee, two of which were obtained in March and one in October. Antram says *durga* occurs here.

Limenitis zulema Db.

Many specimens seen in the hands of professional collectors at Cherrapunjee. Not seen by us anywhere on the wing save at Syndai in October.

F25. *Pantoporia nefte inara* Db.

Fairly common at Dawki in November and since it has also been obtained at Gauhati in September it must also be obtainable on the slopes of the hills towards Kamrup. Also noted at Syndai in October. Many from below Cherra.

Pantoporia cama M.

Cherrapunjee in March and Margaret Falls near Umran on the Shillong-Gauhati road in October, not rare. Many from below Cherra.

Pantoporia selenophora selenophora Koll.

This species is common and we have obtained it near the Circuit House at Cherrapunjee in October and at Mawsmai also near Cherrapunjee in March. It is common at Margaret Falls near Umran on the Gauhati-Shillong road in October and like the males of *cama* it is fond of sitting on the hot tarmac. These various species which like to sit on the tarmac must be looked for there before mid-day since after that time the surface gets too hot for them. *Selenophora* is also obtainable at Dawki in February and many other localities.

Pantoporia zeroca M.

This is also a fairly common species on the tarmac at Margaret Falls on the Gauhati-Shillong road (in the Mile 40 area) in October. This month appears to be best in the Khasi Hills for obtaining good specimens of the genus *Pantoporia*.

Pantoporia opalina orientalis El.

Common on the 'Causeway' on the Shillong-Sylhet road in October. It is also obtainable on fine days in June and October at Cherrapunjee. It is noticeable that the specimens of *orientalis* from the Khasia Hills are much darker than those from Darjeeling.

Pantoporia ranga ranga M.

This is an uncommon species of which it is difficult to get good specimens. The best locality is Dawki in November but the tarmac at Margaret Falls also attracts it in October. Taken at Nongpoh and Syndai in the same month.

Pantoporia pravara acutipennis Fruh.

This is an uncommon species but the tarmac at Margaret Falls generally attracts a few in July and August. Two at Dowki in November.

Pantoporia asura asura M.

We have obtained four specimens of this rare species at Mawsmai near Cherrapunjee in March and one at Syndai in October and a few from below Cherra.

Pantoporia perius L.

Common everywhere below about 3,000 feet but has also been taken in Shillong in July.

F26. *Neptis columella ophiana.*

One specimen obtained at Dawki in November and one at Umran Nong Kharai in October. It must be more common than this leads one to suppose. We have also obtained two at Syndai in October.

Neptis magadha khasiana M.

Rare. Umran, Mile 42 G.S. road October, Dowki one April and one November. Also one below Cherra.

Neptis hylas astola M.

In higher hills. Common.

Neptis hylas adara M.

In lower hills and plains. Common.

Neptis soma soma M.

Not rare. Our specimens are from Cherra.

Neptis nandina susruta M.

Very common, specially at low levels.

Neptis yerburyi sikkima Evans.

Not common like *nandina*. On Assam and Sylhet sides.

Neptis sankara quilta Swin.

One from Nongpriang below Cherra, early October.

Neptis vikasi pseudovikasi M.

Not rare. In forest areas below high plateau.

Neptis cartica cartica M.

Not rare. Our specimens are from Cherra.

Neptis miah miah M.

Rare. Margaret Falls, Mile 40 G.S. road, one in July, one in December. One from below Cherra.

Neptis antilope antilope Leech.

Very rare. One taken by us in Shillong in October.

Neptis viraja viraja M.

Uncommon. One at Dowki March, others from below Cherra.

Neptis hordonia hordonia Stoll.

Common through the year. Also in Shillong.

F27. *Cyrestis cocles cocles* F.

Many specimens obtained from Cherrapunjee professional collectors which are said to have been obtained in the Shella area.

Cyrestis thyodamas thyodamas Bdv.

Found at the foot of the hills on the Sylhet border in April. We obtained numerous specimens at Dawki in March and November. Many specimens have also been seen and obtained at Cherrapunjee in June. At least one specimen was bred by us in April from a larva found in March at Poongtoong on the Shillong-Sylhet Road. One or two have been taken at Syndai in October.

F28. *Chersonesia risa* Db. and Hew.

One taken at Burnihat in July. A number obtained at Dawki and some also at Mile 36 on the Gauhati-Shillong road. Several taken at Syndai in October.

F29. *Pseudergolis wedah* Koll.

This species has been noted at plains level on the Kamrup border in April and has been obtained by us on the warm tarmac below Pynursla on the Sylhet road at the end of September and in October. It seems to be very uncommon in Assam. Several produced from below Cherra.

F30. *Hypolimnas bolina* L.

Generally common in suitable open localities and along hedges at plains level. Both sexes are very common at Dibrugarh in Upper Assam.

Hypolimnas missippus.

We took one male in Gauhati so it must occur in the foothills.

F33. *Doleschallia bisaltide indica* M.

Seen in Shillong in September, and some obtained at Dawki in July and November. Others seen at Dawki, Laitlyngkot and Poontoong.

F34. *Kallima inachus inachus* Bdv.

Common at plains level particularly at Dawki and also on the Kamrup side. Several obtained by us at Mawsmai near Cherrapunjee and at Mile 36 on the Gauhati-Shillong road in June and October.

Kallima alompra M. (*knyvetti* deN.)

This species was taken by one of us in the Nambor Forest at the foot of the Naga Hills but it does not occur in the Khasia Hills, according to our information.

F35. *Precis hierta magna* Evans.

Common from Nongpoh to plains level towards Kamrup. Sometimes seen in Shillong.

Precis orithya ocyale Hut.

Very common all over the high plateau at all times and occasionally lower down. At dusk the larvae may be found climbing up the grass at Cherrapunjee and can easily be reared on a small weed which looks very like the English plantain by which method many fine specimens with occasional varieties can be obtained.

Precis lemonias lemonias L.

Very common low down and particularly so in the valley of the Umran river south of Burnihat and throughout the plains of Assam.

Precis almana almana L.

Common in the same localities as *lemonias.*

Precis iphita iphita Cr.

Common at Elephant Falls above Shillong, but very rarely seen on the high plateau: common at low levels on the Kamrup side. It is very common all over Assam.

Precis iphita iphita Cr.

Common everywhere in the district including Shillong.

F36. *Vanessa indica indica* Herbst.

The imagines of this species are not very often seen but the larvae are very common on nettles at Mawplang in August and are very easy to rear. Some interesting aberrations have been obtained, details of which it is proposed to publish later. Among the more common aberrations is one which approaches *nubicola,* in the fusion of the two lower central black spots which are also confluent with the basal dark areas of the fore wing. This aberration is however without the black termen on the hind-wing of *nubicola.* One of us has also secured a very small specimen of this species which measures only 45 mm. against the normal 65 mm.

Vanessa canace canace L.

Common all over the district. Good specimens are however scarce. The larvae feed on a very thorny creeper of the genus *Smilax* and are very easy to rear but the pupae are delicate and need careful handling.

Vanessa cardui L.

Very common everywhere. Thistles are plentiful all round Shillong and on the high treeless plateau. The larvae are very easy to rear. Aberrations are very rare indeed and minor variations are all that can be expected. Hundreds of specimens congregate on the *Buddleia* flowers on the Peak in November.

Vanessa cashmirensis aesis Fruh.

Although there is no reason why this species should not be found on the high plateau we know of no record.

F38. *Symbrenthia hippoclus khasiana* M.

The imagines can be obtained in Shillong and other places or the high plateau in June. At times large numbers of larvae can be found on the nettles and a good series can easily be bred out. Common in the low hills down to the plains.

Symbrenthia hypselis cotanda M.

Several specimens have been obtained on the slopes towards Sylhet. One specimen was caught in Shillong by us in September.

F39. *Argynnis hyperbius hyperbius* L.

This species is common in Shillong and all over the high plateau througout the summer. The larvae are frequently found on pansies in the garden.

Argynnis childreni childreni Gray.

Very common at high levels.

Argynnis laodice rudra M.

This species is uncommon but specimens are generally to be obtained at Laitlyngkot, on the Peak above Shillong and at the back of Kench's Trace on various wild flowers during the first part of the monsoon. Wild raspberry blossom at Mile 21 on the Sylhet road at the end of May and beginning of June generally produces a couple of specimens every day.

Argynnis lathonia issoea Db.

An intensive search has failed to find this species in the Khasia Hills although there would appear to be no reason why it should not be found since it is known to occur in the Chin Hills and probably also in the Naga Hills.

F41. *Cupha erymanthis lotis* Sulz.

Not rare at Dawki on the Sylhet side and at Burnihat and in the valley of the Umran River on the Kamrup side. A few specimens have also been obtained near Mile 40 on the Gauhati road up to October. Not seen elsewhere except in the thick woods near Lumding in Nowgong District and one at the foot of the Naga Hills during a week's search.

F42. *Atella phalantha* Drury.

Common at low levels and on the plains of Assam throughout the rains particularly at Dawki from March and April; also seen sometimes in Shillong.

Atella alcippe alcippoides M.

Not common. We have obtained a few specimens at Dawki in November and August.

F43. *Issoria sinha sinha* Koll.

Taken on the lower slopes of the hills towards Sylhet. Not rare in the area of Mile 40 on the Gauhati road where it is fond of sitting on the hot tarmac and roadside gravel in early September. The latter specimens are very large. One taken at Syndai in October. It seems very uncommon.

F44. *Cynthia erota erota* F.

Common in Shillong from June and at Jowai. It is available on the high plateau in October and below Cherrapunjee in March. It is generally common at low levels throughout the summer but good specimens of the female are rare.

F45. *Cirrochroa aoris aoris* Db.

This species is more common on the Gauhati Road in August and September than the Cabbage White ever is in Shillong. It is available in Shillong also from April, and below Cherrapunjee in April, September and October. It is probably the commonest butterfly in the district.

Cirrochroa tyche mithila M.

Not common but a few specimens are generally available on the Gauhati road near Mile 40 early in September. Taken in Shillong from May also.

F47. *Cethosia biblis tisamena* Fruh.

Very common in Shillong and all over the hills at higher levels from May to October. Large numbers of the pupae are found on grasses and levels at Mile 24 on the Sylhet road in October, but many of them are parisitized.

Chethosia cyane Drury.

This species is often seen in Shillong during the monsoon particularly the females. The males are commoner lower down on the Kamrup side in the area of Burnihat and above Dawki on the Sylhet side.

F49. *Ergolis ariadne pallidior* Fruh.

Not rare at low levels.

Ergolis merione assama Evans.

Common at low levels and throughout the plains of Assam. It is generally found in the vicinity of castor plants. Taken in Shillong.

F51. *Pareba vesta vesta* F.

Very common indeed everywhere. Some fine dark varieties of the female are generally available in Shillong in small numbers in August and early September. At times the brown and black larvae are exceedingly numerous and in the middle of August large numbers of the black and white pupae are generally to be found on grasses and low herbage at Upper Kench's Trace just beyond Bishop's House.

F52. *Telchinia violae* Fab.

In the orange groves at Burnihat in April. Rare.

ERYCINIDAE.

G1. *Libythea myrrha sanguinalis* Fruh.

A few are generally to be found in August on the shingle and stones beside the river at Snongpadeng village near Dawki. The genus *Libythea* is always fond of sitting on hot stones and shingle. We have noted this species on stones in the bed of the small stream below the Inspection Bungalow at Laitlyngkot at over 6,000 ft.

G2. *Zemeros flegyas indicus* Fruh.

Common at all levels from April.

G3. *Dodona ouida ouida* M.

Not rare on the road to Sylhet on the 'Causeway' and other localities near Pynursla. The female is rare.

Dodona adonira adonira Hew.

Rare. From below Cherra. We have no female. *Dodona eugenes* and *Dodona egeon* are recorded by Bingham from here.

Dodona henrici longicaudata deN.

We have obtained three perfect specimens of this very rare butterfly sunning itself on the warm tarmac just below Margaret Falls (Mile 40) on the Shillong-Gauhati road at the end of the monsoon.

G4. *Abisura fylla* Db.

Common in Shillong and in woods on the high plateau. It is particularly common in the woods close to Mawsmai near Cherrapunjee where the rarer female is also obtainable.

Abisara neophron neophron Hew.

One or two have usually been obtained by us each season at fairly low levels, though we have a specimen from Mawsmai near Cherrapunjee. It is usually found in deep shade in the jungle. Margaret Falls on the road to Gauhati and jungle paths along the river north of Dawki are good localities. This species so closely resembles *Abisara chela chela* deN. that it is more than possible that we have also seen *chela chela* and mistaken it for *neophron.*

Since completing the above list we have been able to obtain a copy of Talbot's 'Butterflies' from the *Fauna of British India* series which, owing to war conditions, we were not able to examine before. As a result certain changes in the generic and specific nomenclature of the list are necessary to bring it up-to-date. These changes are enumerated as follows :—

PAPILIONIDAE.

Poydorus Swainson	replaces	*Byasa* Moore
Graphium Scopoli	replaces	*Zetides* Hubner *Pathysa* Moore *Paranticopsis* deN. and *Meandrusa* Moore
Lamproptera Fab.	replaces	*Leptocircus* Swainson

PIERIDAE.

Cepora Billberg	replaces	*Huphina* Moore
Valeria Horsfield	replaces	*Pareronia* Bingham
Eurema Hubner	replaces	*Terias* Swainson
Appias lyncida eleonora Boisduval	replaces	*Appias lyncida hippoides* M.

BAT MIGRATION IN INDIA AND OTHER NOTES ON BATS.

BY

HUMAYUN ABDULALI

Some years ago (1940) my attention was drawn to a book *Ten Years Under the Earth* by Norbert Castaret in which there was a reference to bats migrating from France to Japan.

This was very unexpected and an inquiry put to Prof. Landsborough Thomson failed to elicit a confirmation. In his reply he stated that " there was at one time supposed to be evidence that bats crossed the Atlantic, but this was shown to be ill-founded ". He also referred to some notes on the subject in the *Journal of Mammology*, and some interesting information on the movements of Fruit Bats in Australia by Ratcliffe in the *Journal of Animal Ecology*, 1926, Vol. 1, p. 32. These papers, however, are not accessible to us.

In spite of the fact that there was no obvious evidence of bat migration similar to bird migration, all observers in India must have noticed that the smaller bats appear to come and go during different seasons. In 1942-43 when travelling was very restricted, we thought it would be a good idea to keep notes on the bat population in the caves of Elephanta Island in Bombay Harbour, and the writer with Messrs. Sálim Ali and Charles McCann made an attempt to do so. It was unfortunately impossible to keep notes over any length of time and no concrete evidence of migration is claimed, though they certainly indicate that extensive notes kept over a longer period would bring in valuable information.

As in birds, it was evident that the only method of individual identification was to ring them and we used a small aluminium bird-ring on the bat's forearm, the membrane being slit and the ring turned over the bone. All the males were ringed on the left wing; females on the right in order to facilitate observations.

Our attention was necessarily restricted to the bats inhabiting the several caves and dungeons and no tree-inhabiting bats were collected.

The fragmentary notes are summarised under each species.

The Fulvous Fruit Bat—*Rousettus leschenaulti* (Desm.)

This was the most numerous species, and was seen at some time or the other in all the caves, though the larger number was usually in the " Dungeon Cave " at the western end of the cave-hill. The entrance has fallen in and the floor has also silted up to some extent. The average visitor does not approach or enter this cave.

On 11 April, 1942, the fruit-bats were plentiful and roughly estimated at about a thousand. Many had young clinging to them. When first approached they squealed in chorus, with intervals of complete silence. On further molestation, they flew out of the cave and hung on the rocks and trees outside. This was at about 6 p. m., but Pariah Kites were attracted and two bats were seen to be captured on the wing. In the excitement, several young fell off their mothers in the cave.

On 10 May most of the young were independent, and we made our first attempt at ringing. Of 43 bats captured (with a large butterfly net) 26 were males and 17 females (as against 9 males and 21 females on 14 June). The sex ratio over the total number examined was 35 males to 38 females (52 per cent). Of 16 juveniles included, 11 were females (69 per cent).

On 26 July, they were still abundant, but on 29 November this Dungeon Cave was deserted except for 5 or 10 individuals. There is definite indication that they had left the locality in late November.

On 10 January, 1943, their numbers had increased to some extent. On 28 March 150-200 bats were back, the females being pregnant or with new-born young. Hundreds were back again on 8 October, 1944.

At Kihim, across the Harbour, about 16 miles from the caves, on 13 May, 1943, my brother Shamoon picked up one of the bats ringed by us on 28 March, struggling on the ground, covered by ants and with a festering wound near the ring.

In the cave harbouring these fruit bats, there was in the right-hand corner a hole running into the earth at an angle of 45 degrees or more. A quill outside suggested a porcupine and an attempt to investigate the hole further was discouraged by a rumbling noise from within. Small numbers of two small bats, *H. fulvus* and *R. rouxi*, were occasionally noted in this cave, but in separate corners and far from *Rousettus*.

Tenebrionid beetles were abundant on the walls and on the floor under the bats, presumably being associated with the bats' droppings.

A Chrysomelid beetle, *Aulacophora* sp., formed small clusters on the walls, in this and other caves. The large gecko (*Hemidactylus maculatus*) was seen in this cave as also a monitor lizard (*Varanus*) at the entrance.

Mr. McCann has more detailed notes on the biology of this bat on Salsette Island, *J.B.N.H.S.* 41, pp. 805-816. Brother Novarro of St. Xavier's High School informs me that there are several large colonies of this species in the tunnels on the disused railway line just below Khandala. These tunnels are deserted about the end of June (depending upon the incidence of the monsoon) and the bats return early in December.

The Bicolored Leaf-nosed Bat—*Hipposideros fulvus* (Gray.)

On 11 April, this and the next form were thinly scattered all through the series of caves, but formed largish colonies in the two small caves on either side of the main cave. (These will be referred to as the Right and Left cave.) Here also they appeared to form independent colonies, this species being more numerous in the Left cave though a few were captured in the Right. The next species appeared to be more restricted to the Right cave. 39 were ringed of which 28 (71 per cent) were females, many being heavily pregnant. Six secured in the Dungeon Cave were all females.

On 14 June, many females were carrying new-born young. On 25–26 June, both this and the next species were scarcer and on 29 November, as in the fruit bat, their numbers had dwindled to a few individuals.

The Horse-shoe Bat—*Rhinolophus rouxi* (Temm.)

As stated above, this was common in the Right cave on 11 April and was not seen on the 10 May when both the small caves were in the possession of the previous species. On 13 and 14 June, they had regained their numbers in the Right cave, several juveniles and newly-born young being noted. Later, their numbers decreased in the same way as for other species.

Of 11 ringed on 14th June, 9 were sexed and included six females (66 per cent).

The Indian Vampire Bat—*Megaderma lyra* (Geoff.)

This was first noted on 25 July when 5 or six were seen in the Left cave with a greater diminuation in the numbers of both the small bats. Had the monsoon driven it in and was its presence responsible for the departure of the smaller bats? Below their perches, we picked up the wings of two species of Noctuid moths, *Ophiderus fullonica* L. and *Ophiusa coronata* F. which had been taken by this bat in some numbers. Both these moths have the hind-wings brightly colored (black and yellow). No remains of plain coloured moths were seen.

Solos of this bat were noted on 25 October and 29 November, though none were seen on 10 January.

The Long-armed Sheath-tailed Bat—*Taphozous longimanus* (Hardw.)

This can immediately be identified in the field as it clings to the vertical wall rather than the ceiling as do the other bats. Three or four were seen on almost every trip, but were solitary and seemed to live happiest apart. They were more frequently in the small lingam cave adjoining the rock-pool from which water is drawn. Curiously, the five individuals ringed on 9 May and 13 June were all males, and in spite of the scarcity of their numbers, none seen there again on the 10 January carried a ring.

The Bearded Bat—*Taphozous melanopogon*, of which there is a large colony at the Kaneri Caves in Salsette Island was not observed at Elephanta.

After the above notes were compiled, I noticed a very interesting article in the July 1946 issue of the National Geographic Magazine entitled 'Mystery Mammals of the Twilight' by Donald R. Griffin of Harvard University. In view of the very limited information in India and the unavailability of literature, I have been tempted to pick out the highlights of this article as it may be a very long time before we are able to bring together similar information concerning Indian species. The following is almost a verbatim extract from the article.

Most of the bats in the United States belong to the family Vespertilionidae which feed exclusively on insects. Those living in the Northern States therefore find themselves without food in winter. This difficulty is overcome by one of two methods—Hibernation or Migration. As a general rule, cave bats hibernate while those that live outside migrate. The North American Red Bat, *Lasiurus borealis*, is reported to appear in Bermuda in autumn and disappear again at other seasons. If this is true, it must make a sustained flight of more than 600 miles over the open ocean.

In Germany, Dr. M. Eisentraut, banded several thousand bats and recaptured many of them later. One, *Nyctalus noctula*, was recaptured nearly 500 miles from where it was banded and several others were recorded after they had travelled more than 100 miles.

Mr. Griffin banded the bats on the hind legs with an aluminium bird band of the smallest size and some of his bats have been recovered 150 to 170 miles from the caves where they were banded in winter.

There is reference to a very positive homing instinct in bats, 30-40 per cent of those banded in a given cave being retaken in the same place the following winter. Bats transported over distances upto 150 miles also found their way back with comparative ease. 24 were released out at sea 12 miles from the nearest island and 35 miles from their home roost. Six of these or 25 per cent were later retaken at the building where they were banded.

It is also noted that bats from large caveless areas have to migrate to limestone areas to enable them to hibernate.

Another very interesting part of the article explains the remarkable and inexplicable manner in which the bats have always been known to avoid obstacles in the dark. As far back as the 18th century, the Italian scientist, Lazaro Spallanzani wrote that bats which had been blinded flew about the room avoiding walls, furniture and silk threads stretched in their path. His friend, Louis Jurine, repeated these experiments and made the additional discovery that bats lost their ability to avoid obstacles when their hearing was impaired. This observation was again confirmed by Spallanzani, but the celebrated anatomist, Georges Cuvier expressed his incredulity in the quip 'Since bats see with their ears, do they hear with their eyes?' So convincing were a great man's words that Jurine's discovery was completely forgotten until the present century, when Dr. Robert Galambos and Mr. Griffin, by holding a bat before an electronic apparatus for detecting supersonic sounds (sounds of a pitch higher than what the human ear can hear) found it actually making loud supersonic cries. Their later experiments showed that the echoes of these cries enabled the bats to detect obstacles in their flight and dodge in time to avoid collision. This has been established as the chief mode of perception available to bats and is so distinct from other types of perceptions that a new word 'echolocation' has been coined to represent its meaning. This can be so exact, that even when blind-folded they can fly between vertical 16-gauge wires spaced 12″ apart, brushing the wires only once in 6 to 10 passages. They do this while flying at full speed, 'echo-locating' the wires when a foot or two away, and banking or pulling in their wings to pass between them.

The process of 'echo-location' is not confined to bats, and many totally blind persons acquire an uncanny ability to move about without striking furniture, walls or other obstacles. Most of them have no clear idea how they do this. Three psychologists at Cornell University have shown that they lose this ability if their ears are stopped.

In foggy, coastal waters fishing and steamboat captains can detect the presence of cliffs or rocks by blowing a short blast with the ship's whistle and listening for echoes. Another example is the sonic depth-finder or the fathometer which sends down sound waves through the water and measures its depth by the time interval between each sound and its echo.

The modern miracle of Radar is analogous to this process, but different in so far as Radar employs radio waves while bats use sound waves.[1]

While talking of bats, it might be interesting to record that E. C. Humphries and T. S. Jones in an interesting article on bat-hunting in Trinidad published in the *Field* dated 19 January, 1946, state that the Vampire Bat is 'the carrier of paralytic rabies—a dread human disease'. This bat is also known to transmit Murrina, a trypanosome disease of cattle, a factor of some economic importance in many parts of South America.

They also say, 'One of the most interesting Trinidad bats is the Fisherman Bat observed and described as long ago as 1871 by Charles Kingsley in "At Last". It may be seen at dusk, skimming over the sea, occasionally darting to the surface to pick up a fish. Owing to the difficulty of observing this bat at close quarters, together with the poor light at the time they were active, there is still some controversy about the exact method of catching their prey. The current opinion is that the interfemoral membrane (the membrane between the hind legs) scoops downwards as the bat approaches the water and acts as a brake to its motion. It was formerly thought that the interfemoral membrane acts as a scoop to pick up the fish, but the prey is probably lifted out of the water by the claws of the hind feet which are large and apparently well adapted to this purpose. These bats live in colonies, usually in sea caves but they have also been found in hollow trees and under houses. Their presence is usually quickly detected by the unforgettable stench which is a mixture of bat odour and decaying fish!'

It might be interesting to recall that there has been some discussion in India regarding the fishing propensities of the Flying Fox which is known to skim over water. McCann in his notes on the Flying Fox, (*J.B.N.H.S.* 37, pp. 146) discredits this habit, and though we have seen bats do this on both fresh and salt water we agree with him. Dr. E. W. Gudger in Fish-eating Bats of India and Burma (*J.B.N.H.S.* 43, pp. 635-40) has gone into the question in detail and it appears that in our area, only the Vampire Bat, *Magaderma lyra*, has been known to eat fish, small pieces being found under their roosts. How the fish are caught is unknown, but a considerable number of frogs are also said to be taken by this species.

Bats are abundant in India and of many kinds, but so little is known of their habits that any information which members may be able to offer from their own experience would be of considerable value.

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[1] For more details see 'Bat Radar' by Richard H. Knight (The New Biology, 1947—Pelican Books).

ABNORMAL PALMS OF TRAVANCORE III:

A BULBULLIFEROUS COCONUT PALM (*COCOS NUCIFERA* L.)

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(*With two plates*)

INTRODUCTION

The coconut tree is one of the most common plants along the coastal plains of Travancore. The palm is so familiar and so remarkably uniform in its outward characteristics, that one hardly has any opportunity of observing variations in them. Many freaks in coconut palms undoubtedly do occur, some of which have been recorded by eminent scientists from time to time.

The palm under discussion is the one growing at Manguzhi near Eraniel, South Travancore with an abnormality in flowering. Regarding floral abnormalities in *Cocos nucifera*, Shortt (1) has seen at a horticultural show in Travancore that from the flowers of the spadix a shoot of spring leaves was thrown out with a slight tendency to fructification from the flower and then converted into spring leaves apparently forming a young shoot. The same author has seen a forked tree which never puts forth well developed fruits ; on the contrary the flowers terminate in vernal leaves. On an average each spadix or branch bears about thirty or forty such shoots at a time. Venkataraman (2) observed an instance of bulbulliferous spadix (which he called parthenogenesis) occurring in a coconut palm. The buttons or the young nuts in the spathe did not develop into normal fruits, but some of them grew into bulbils somewhat resembling ordinary seedlings. The abnormality could be traced to a very early stage before the spathe actually opened. The seedlings when planted in the soil failed to get established.

From the above facts it is clear that a flower or a button is capable of giving rise to a small seedling without becoming a normal fruit. But in the interesting palm under study we see the entire inflorescence or the spadix being converted into a seedling. Unlike the above instances where many seedlings are produced from a single spadix, this plant gives rise to only one seedling in the place of one whole spadix. Hence the seedlings of this plant are healthier, bigger in size and less in number. Ridley (3) Burkill and Sands (4) have recorded similar instances where the spadices instead of normally developing in the flowers and fruits have grown into branches four to five feet long in the axils of the leaves. Dr. M. O. P. Ayengar has also described a coconut palm giving rise to bulbils.

Ridley (3) and Sands (4) report a palm which gives unbranched bulbils. *But the palm under discussion gives rise to bulbils which remain simple in the early stage and which grow bigger and bigger giving rise to branches even upto fifteen in each* (Plate II, 3. h and i). Thus one well developed and branched bulbil of this palm will appear four or five times bigger and weigh proportionately heavier than the bulbils reported by the above authors. Thus instead of a single bulbil from the axil of a leaf, here we get nearly a dozen bulbils due to the further development of the original ones.

DESCRIPTION OF THE PALM

The bulbulliferous palm growing at Manguzhi is now nearly forty years old. It was planted as a small seedling along with hundreds of others in the same field. The early growth of the palm was so normal that nobody noticed any peculiarity in it till it began 'flowering' at the fifteenth year. The floral peculiarity was noticed by many including the owner. Apart from the spadix abnormality the palm is quite normal, having a fairly thick crown.

THE INFLORESCENCE

The inflorescence of a normal coconut palm is a spadix about four feet long, stout about the middle, and tapering towards the apex. It stands at first erect and finally droops down. The spadix is enclosed in a tough pointed longitudinally grooved bract called the spathe (inner) which is elongated, boat-shaped, about the same length as the spadix and covered by a brown tomentum without. At the base of this inner spathe and extending nearly a third of its length is the outer spathe. In addition to these two, there are two more inconspicuous ones. The one at the base of the outer spathe is about an inch long, scale like and may be called the first or the outermost bract. The scaly bract at the base of the spadix may be called the fourth or the innermost or the primary bract in relation to the spadix. The branches or the rachillae are subtended by small inconspicuous secondary bracts and each branch is a long androgynous spike with a few female flowers towards the base and the numerous males above.

In this abnormal palm also the bulbulliferous 'inflorescence' is about four to five feet long in the young stage which uniformly tapers above; and has no bulged region in the middle. At first it is erect and is in a line with the main stem. As it matures it gradually turns side-ways and makes an angle of about sixty degrees to the growing apex. It does not droop down further as the normal spadices do even in the later stages. Unlike the normal spadix which has got four spathes (including the bracts) this bulbil has got an indefinite number of them. This can be seen clearly from plate I,2 where a dissected bubil is shown along with a normal spadix. The small inconspicuous secondary bracts in a normal spadix subtending the branches or the rachillae are highly developed at the expense of the rachillae which are reduced to rudimentary buds.

The rudimentary secondary bracts subtending the rachillae of a normal spadix can be very clearly seen in the case of unbranched spadix reported by Sands, where the bracts which are fairly developed are seen to subtend few flowers in their axils. Specimens of such interesting unbranched spikes collected and reported by Jacob (5) can be seen in the Madras Herbarium, Agricultural College and Research Institute, Coimbatore. The unbranched spadix can be said to be an intermediate stage of bulbil formation. In the unbranched spike, the lateral branches or the rachillae with numerous flowers are highly reduced to the state of only three or four flowers. Again the inconspicuous rudimentary bracts subtending the rachillae have developed considerably and are conspicuous and big enough to cover and protect the flowers in their axils. The last stage of the transformation of the spadix is the bulbil formation, where the rachillae are extremely reduced to small buds (which after a long period of rest in this particular palm develop into branches each forming a small bulbil) and the bracts are developed to their maximum which gradually become true pinnate leaves. The gradual conversion of the spathes which are nothing but the developed bracts into pinnate leaves can be seen from plate II, 3. a–g. Hence a bulbil in the young stage possesses a compact series of spathes of different developmental stages arranged in an acropetal condition. As the bulbil grows its basal region swells up like an onion bulb (vide plate II, 4). As it advances in age the bulbil produces more and more narrow spathes whose tips become coiled in the early stages. As more and more new spathes emerge their coiled tips gradually develop into leaflets Thus pinnate leaves are developed from the spathes. After the formation of the many leaves the bulbil looks like a small branch which produces secondary branches after a certain period of growth. The secondary bulbils are homologous with the rachillae of the normal spadix. The author has counted eight to fifteen branches in many bulbils. Hundreds of such bulbils give the crowded appearance of the crown (vide plate I, 1).

N.B.—The leaflets of the bulbils even in the young stage are quite free and separated from each other like those of adult palms as against the fused leaflets of a normal young seedling.

It is interesting to note that the bulbil formation is just the reverse of the formation of an inflorescence. In an inflorescence the normal leaves are reduced to bracts and the buds in their axils modify themselves into flowers or inflorescence-lets. In this case the bracts expand themselves to form spathes which develop into true leaves. The buds in their axils which represent rachillea (branches of spadix) develop into vegetative branches (bulbils).

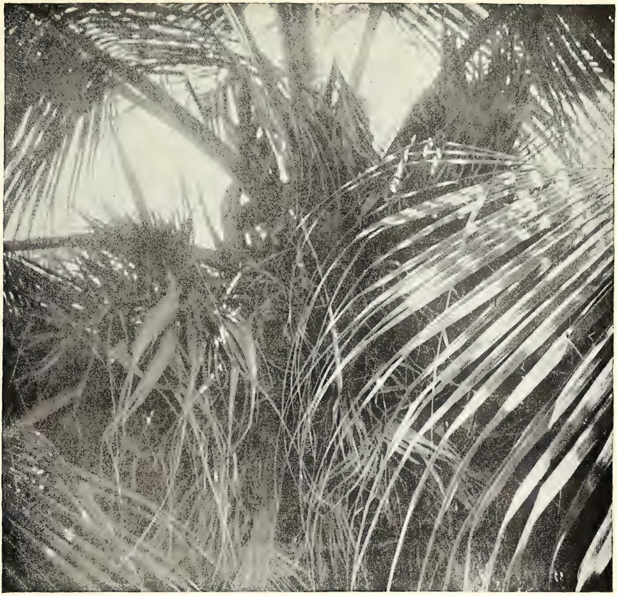

Photo by *T. A. Davis*

1. Close-up of the crown of the bulbulliferous palm.

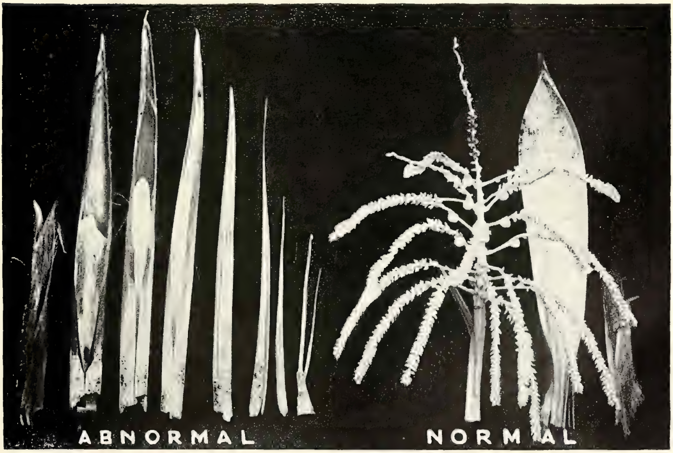

Photo by *T. C. Paul*

2. The dissected inflorescences of both the abnormal and normal palms.

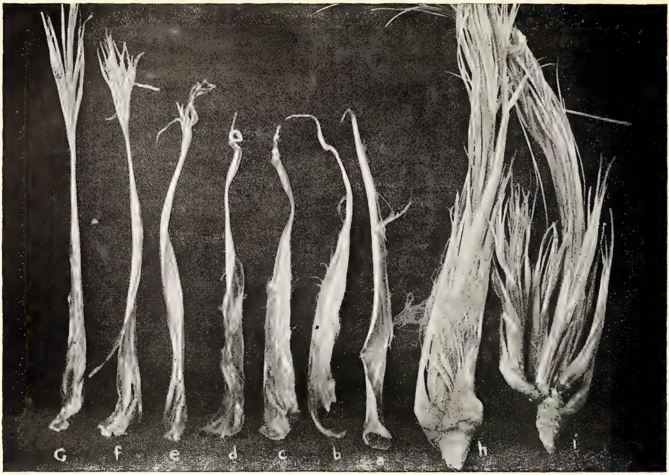

Photo by *T. C. Paul*

3. (a—g) The conversion of the spathes into pinnate leaves.
(h & i) Development of compound bulbil from a simple one.

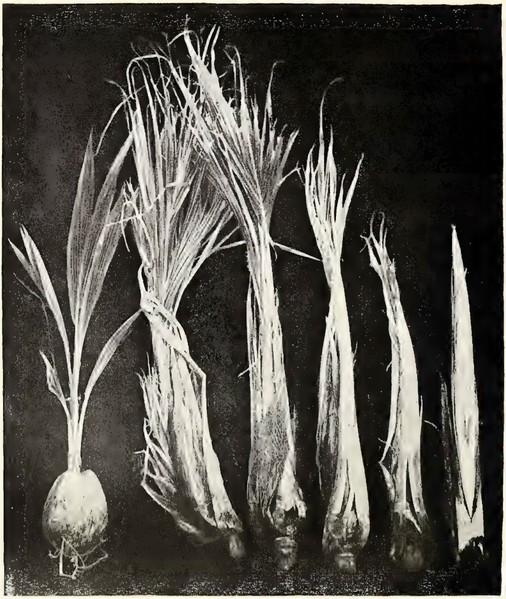

Photo by *T. A. Davis*

4. Normal and abnormal coconut seedlings
Note the gradual development of the abnormal seedling from a closed spadix
'inflorescence'

Cytological and Histological Studies

To see if the abnormality is accompanied by chromosomal differences, root materials were taken from the same palm. Fresh roots (only the vigorously growing tips) both from the abnormal and a normal palm growing in the same field were fixed in different fixatives—Chromium Acetic Formalin and Uraniam—at about 2 p.m. to study the variations in them. The cytology of the palms is being studied. Comparative anatomical work of the palms is also in progress. Specimens of only the leaves and roots of the abnormal palm were available. However, striking differences in the structure of leaves were not noticed.

Growth trials with the Bulbils

The first question that will occur to one on seeing the bulbils is whether they will strike roots and establish themselves if planted in ideal conditions? Many bulbils from the particular palm are grown after treatment with auxins such as Indole acetic acid, Thiourea, Dimethyl tetrachloro phenoxyl acetic acid, Ethylene Chlorhydrin etc. The first chemical that is being tried is B Indole acetic acid. Different concentrations of the acid solution are treated separately with different sets of bulbils. After careful planting water is given at regular intervals. Some of the bulbils are expected to give very encouraging results since they appear to get established. Further observations are in progress.

A detailed study—cytological, anatomical, growth trials etc.—of this highly interesting coconut palm in progress is expected to be of great importance due to the novelty of the freak. The results will be presented as a separate paper.

Acknowledgment

The writer wishes to express his deep gratitude to the Government Lecturing and Systematic Botanist, Sri S. N. Chandrasekhara Iyer, M.A., for his kindly guidance and constant help in the preparation of this paper. Also his thanks are due to Mr. C. M John, B.A., the Oil Seeds Specialist, for his keen interest and valuable suggestions made in bringing out this piece of work.

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OBITUARY

H. H. SHRI VIJAYARAJJI MAHARAO OF CUTCH

(*With a plate*)

By the death of His Highness Shri Vijayarajji, Maharao of Kutch, on 28 February 1948 the Society has lost one of its most sympathetic friends and benefactors.

His Highness assumed the reins of government in 1942 at the age of 57. During the short span that was vouchsafed him as ruler, he introduced a number of measures for the betterment of the lot of his subjects, and for liberalizing the State administration. However, it is perhaps not so much as a ruler, but as a man that his memory will best abide. His naturalist and sporting friends will remember him not only for his genial personality and his genuine love of nature but for his unfailing readiness to assist in all schemes for the advancement of biological knowledge, especially concerning his own territories.

In his younger days as Maharajkumar and even uptil recently, before some knee trouble forced him to give up strenuous physical exercise, he was reputed to be an excellent rider and an outstanding all round sportsman. As a tennis player he figured regularly and prominently in many all-India championships. His prowess with the shot gun had become a by-word amongst his confrères, and though unable to indulge his love for small game shooting as vigorously as before, he nevertheless retained his expertness as a bird shot to the end. Inability to participate in field sports threw into relief a facet of his nature that was perhaps somewhat overshadowed in more active days. This was his intense love of wild life and solicitude for its conservation. His particular interest seemed to lie in the domain of birds and it was mainly as a lover of birds that the writer had the privilege of his friendship. It was at Maharao Vijayarajji's invitation that a proper survey of the birds of Kutch was undertaken, and later it was he again who sponsored the publication of the 'Birds of Kutch', a work which has so clearly demonstrated the desirability and usefulness of regional faunal publications of this kind.

I shall long remember the great personal, almost boyish, interest Maharao Vijayarajji evinced in the breeding colony of flamingoes in the Great Rann in 1945 (an account of which is published in Vol. 45 of the Journal); it was completely characteristic of him. Owing to administrative pre-occupations and the poor health he was keeping he was unable to accompany the expedition in person, but short of this he spared no pains to see that the arrangements were perfect in every detail so that the investigation should lack nothing in the way of facilities. The obvious interest and enjoyment with which he followed the answers to his minute cross questioning and the detailed information which the party had brought back were positively refreshing.

His Highness's interest in bird migration was no less. Last autumn he had sponsored a scheme for establishing a chain of experimental self-contained observation posts along the edge of the Great

His Highness Maharao Shri Vijayarajji of Kutch
1886—1948

Rann to be manned by competent observers. He was greatly taken with the idea of establishing permanent observation posts at suitable spots, should the experiment prove promising, with facilities for trapping and ringing migratory birds, rather on the lines of Heligoland and other well known stations. Owing to unseasonable and very heavy rains, however, which submerged large tracts of the area where the proposed work was to be carried out, the project had to be abandoned to be taken up, it was hoped, in the present year.

On his return from the U.S. of America at the end of 1947 after medical treatment, feeling considerably improved in health, he wrote with his usual cordiality and much enthusiasm that he was expecting me to visit Kutch and how greatly he looked forward this time to be able to share a month's birding with me and make up for the opportunities he had missed before. Unfortunately soon after this he went down with an attack of influenza, seemingly mild at first, which confined him to bed for about 10 days and finally took the tragic turn.

The naturalist tradition of the ruling family of Kutch of which Maharao Vijayarajji was such a shining example can be traced back for at least 3 generations. His father Maharao Khengarji whose obituary we recorded in 1942 was a great nature lover, and so was his father Maharao Pragmuljee before him. Maharao Madansinhji who has now succeeded to the gadi with all the best wishes of the Society, can be fully depended on to see that the tradition is upheld.

The late Maharao joined the Bombay Natural History Society as an ordinary member in 1920 and was elected a Vice-Patron in 1943. During this long connection with the Society he took the keenest interest in its affairs and welfare, never denying any help that was asked of him, whether in the way of information, facilities or funds.

He possessed a vast store of authentic information, particularly concerning game birds in Kutch, gathered during a life-time of discriminating shooting and of careful and intelligent observation. Unfortunately he wrote little, and on looking through old files of the Journal we find only the following contributions from his pen:—

Goose-shooting in Cutch,—Vol. XXI, 678.
Gray Quail (*Coturnix communis*) in Cutch,—Vol. XXII, 630.
An Albino Bustard (*Eupodotis edwardsi*),—Vol. XXXI, 526.
Occurrence of the Bronze-capped or Falcated Teal (*Eunetta falcata*) in Kutch,—Vol. XXXV, 899.

It was well for Kutch ornithology therefore that a great deal of the information accumulated by him has found permanent record in the Birds of Kutch. That publication will stand as a fitting memorial to his zeal as a lover of birds.

S. A.

REVIEWS

1. THE TREES OF CALCUTTA AND ITS NEIGHBOURHOOD. By A. P. Benthall Pp. cii+513 (8¾″ × 5¼″) with 274 text illustrations. Calcutta: Thacker Spink & Co. (1933) Ld. 1946. Price Rs. 25.

India has numbers of beautiful and interesting trees which the lover of nature wishes to know about. His efforts to acquire the knowledge are not always successful; people able to satisfy his curiosity are few, and the books on the subject are generally too technical for the ordinary man. For years I have believed some roadside trees near the office in which I work to have been specially imported from Australia, and my children have spoken of them as 'horse-teeth trees', from the appearance of the winged seeds when seen through the crack in the opening seed-case. Now I discover them to be specimens of *Pterygota alata,* known in English as Buddha's Coconut, a native of South-Western India, Sikkim, Assam and some other places, the seeds of which are said to be used in parts of India and Burma as a cheap substitute for opium. In the same way, my children gave their own name, Chiki, to a slender tree with peculiar sickle-shaped 'leaves', and curly seed-pods from which in due time there hung flat black seeds at the end of curly orange threads. No one could tell them anything about it. Now, I discover that this is the *Acacia moniliformis*, a native of tropical Australia, recently imported into India, and that the sickle-shaped 'leaves' are not really leaves, but merely flattened leaf-stalks. The source of my information is Mr. A. P. Benthall's 'The Trees of Calcutta and its Neighbourhood'. The book is intended for persons not acquainted with botany, and in the compass of about 500 pages describes and illustrates over 250 trees. Though confined to trees to be found in or near Calcutta, the book is of much wider application and I have found it useful at Patna in Bihar and Cuttack in Orissa. The descriptions are short, clear and non-technical, and each one is accompanied by carefully-made drawings, a study of which alone is often sufficient to identify the tree. Wherever available, the vernacular (Hindi or Bengali) name and the popular English name are given. These are collected together in the form of an index at the end of the book, and furnish another means of identification. A third means of identification is a key of about sixty pages, based on characteristics within the powers of observation of the ordinary layman. So, if the possessor of the book is unable to identify any particular tree, it will not be for want of effort on the part of the author. For the use of persons acquainted with botany, short descriptions in botanical language have been added in the text. The book is of convenient and handy size, and pleasing in its get-up. Considering the present-day cost of materials and printing, the price is not unreasonable, and I have not the slightest hesitation in recommending it as well worth the money.

D. R.

2. THE BOOK OF INDIAN ANIMALS. By S. H. Prater, O.B.E., C.M.Z.S. With a map, 73 plates in colour, 17 in line and 86 in half tone. Pp. xxxii+263 (7¼″ × 5″) Bombay: The Bombay Natural History Society, 1948. Price Rs. 16.

This is Vol. II of the Indian Natural History Series designed and published by the Bombay Natural History Society, and a companion volume to The Book of Indian Birds which has now attained a 4th edition. It can be anticipated that this volume will be in similar demand.

'It is a book which helps one to know the wild animals seen in the forest, scrubland and fields or about towns and villages in India; which tells of their ways and habits in simple language: in short a book for Nature lovers young and old.'

Thus the short notice on the dust cover; to which may be added that the arrangement of the book readily lends itself to preparation of longer or shorter talks or lectures for instruction in schools and colleges. By themselves these would be interesting and informative, but the more so were they accompanied by lantern slide pictures arranged from the illustrations in the book or others got together for the purpose.

This is of great importance, for there is much need in this country for stimulating the interest of the present generation of young people in the wild life that is their national asset, and the urgent necessity for preserving it from destruction.

'In most western countries Nature Study teaching is a serious part of the earlier stages of the school curriculum.——It is true that in India Nature Study forms part of the curriculum in our primary and secondary schools. But teachers are often handicapped by want of suitable books which they can consult. This book is therefore written with the purpose of providing a popular and well illustrated account which will give people general information about the Mammals of India.'

The book is admirably arranged and is throughout instructive, informative and interesting. The preface (v to xi) and other preliminary and descriptive pages hold the attention of the reader. What is a Mammal? (xii to xxii); How Mammals are classified (xxi–xxii); The Distribution of Mammals (xxiii to xxxii). The pages previous to each of the 19 families comprising the Animals of India are equally interesting. Apes, Monkeys and Lemurs—The Cats—Civets—Mangooses—Hyaenas—The Dog Tribe—etc., etc., Each of these preliminary pages to the species, is followed by 'Descriptions of Species' which give the Local names; Size; Distinctive characters; Distribution; Habits of all the wild animals which inhabit this sub-continent. 'There are more than 500 different species of Mammals found within the Indian Region.'

Notwithstanding the many years of field work by trained naturalists, and the recorded observations of generations of sportsmen, there is even yet something that remains to be known concerning some of the commonest of the Mammals of India. The Common Monkeys of the country: 'We know little of their social life and breeding habits'. The Common Langur: 'Common and easily observable as these animals are we know little of their social lives'. The Common Indian Hare: 'Its particular breeding season is not recorded'; and there are other gaps in our knowledge of a number of the animals dealt with in this comprehensive work; so there is still work for the field naturalist.

On the other hand how much has been discovered; how many of the secrets of Nature have been laid bare through the patient research and trained observation of naturalists. Perhaps it is in regard to Bats that we are particularly brought to realize this. Reading about these creatures we see on most evenings of our lives, we find how little we really know about them. And so it is with many parts of this valuable work.

The issue of this book from the Press has been much delayed, but its appearance now (April 1948) is opportune as greatly aiding the All-India movement being launched by the Society for the preservation of wild life.

Regarding the need for this the author has much to say (pages v to xxxii and other parts of the book), much that is well expressed and authoritative.

'For many years the Bombay Natural History Society, through the medium of its *Journal* and other attractive publications, has endeavoured to create and stimulate in India an interest in the wild life of the country.

The necessity for this interest, particularly among our educated classes, is becoming more and more evident with the passing of time. During the past, extensive undisturbed areas of primeval forest, jungle and desert gave safe harbourage to wild creatures, and provided guarantee of their survival. But changing conditions in the country, the gradual conquest of forests and waste lands; above all the building of new roads and great improvements in methods and rapidity of transport have left few areas in the Peninsula of India which are free from intrusion by Man.

These factors have had, and are continuing to have, a disastrous effect on the wild life of the country. The danger to it has been accentuated in recent years by the enormous increase of firearms in use, and by the inability of many of the Provincial Governments to enforce such laws as exist for the protection of wild animals.'

And again:—

'Various factors, as a result of human activity, are threatening the wild creatures of India with extermination. There is, as we have shown, great need in this country for adequate measures to preserve wild life from the destruction which threatens it.'

It is a common saying that in this world Man has become The Great Destroyer: and in no country is this more marked than in this subcontinent at the present time (1948). Somewhere it has been said, 'Where can a poor animal go these days and not see mankind ?'.

A number of the coloured plates are from the author's own drawings. These, and pictures by other artists, some photographs of scenery and of animals in their natural surroundings and some of Museum exhibits, attractively illustrate the book.

The photograph (Zoo enclosure ?) of the slinking wolf is a libel on the fine appearance of the animal in the wild state as many times seen by the reviewer in earlier days. The author's coloured plate at page 96 perhaps depicts the desert colouration. That of the wolf of the central areas of the Peninsula is different, more grey, like some Alsatian dogs.

On the whole the printing is good ; that of pages 234, 238, 239, and 257 somewhat faulty. There are very few printers' errors. The stitching of the pages does not appear up to required standard for a work which will be much handled in use.

It can be safely anticipated that this Book of Indian Animals will be as popular as has been the companion volume on birds. It will be much in demand by educational institutions throughout the country ; will be welcomed by all lovers of wild life, sportsmen and tourists. In has great value as a book of reference, and should be possessed by all libraries.

R.W.B.

3. THE COMMON BIRDS OF INDIA. By Eha. 3rd edition, pp. xxii+193 (8″ × 5¼″), illustrated with the author's original pen and ink drawings. Bombay : Thacker & Co. Ltd., 1947. Price Rs. 9/8.

Here is good news. EHA'S Common Birds of Bombay, that fascinating book so long out of print, has at last been re-published by Thacker's under the title 'The Common Birds of India'. The new edition contains some explanatory notes by Sálim Ali and a well-written biographical sketch by W. T. Loke.

It is gratifying to note that besides the title nothing else has been changed in the new edition. EHA's original text is intact and even his quaint pen-and-ink sketches have been retained. The present editor is right when he states that to have attempted to replace these original drawings by more finished photographs would have amounted to the desecration of a much-loved personality.

In this book EHA does not baffle the lay reader by scientific terminology, on the rare occasions when he is obliged to make use of it, he hastens to explain that those 'solemn words were not invented only to bamboozle the unlearned'. The book contains patient and acute observation recorded in the most vivid and sparkling language. The author's irrepressible sense of humour seems to manifest itself all the time, no matter what he is talking about. Here is his description of Vultures closing in on a dying animal : 'They descend in decreasing spirals and settle at various distances and wait for the end like American reporters.' Discussing the classification of the Owl, he says, 'Is the Owl only a weak-eyed hawk that cannot bear the light of day, or is it a bold and bad parrot which has taken to night walking and murder ?' How telling is his phrase about the Sparrow : 'a vulgar little body which tries to be a gentleman and attains to being a gent'.

No one who reads this description of sparrows building a nest will doubt EHA's powers of observation ; 'A sparrow comes in and makes up its mind that it will have its nest in the corner of your ceiling. And when a sparrow makes up its mind nothing will unmake it except the annihilation of that sparrow. Its faithful spouse, is always and very strongly of the same mind as itself. So they set to work to make a hole in the corner of the ceiling-cloth, and they tear and tug with an energy which leaves no room for failure. Then they begin to fetch hay. The quantity of hay that a couple of sparrows will carry in a day is almost miraculous. Most of it tumbles down in their efforts to stuff it into the hole, for they always bring larger loads than they can manage. I remember a pair which made a hole directly over one of the pictures on my drawing-room wall, and I declare solemnly that you might have fed a horse on the hay which I removed daily and hourly from behind that picture. This savours of exaggeration, perhaps, but I mean a hack-victoria horse.'

EHA has the same facility of style when he is describing other natural objects : 'When a fig tree fruits, it fruits all over and all at once, offering a feast to the whole country such as a Raja gives when an heir is born to his throne; and as mendicant Brahmins gather from distant provinces to the Raja's feast so the fruit pigeons from afar flock together to the tree while it lasts and gorge themselves twice a day.'

But his gift for accurate, humorous description is not EHA's only recommendation. He is a scientific observer with a poet's soul, for in this book he has distilled for us snatches of picturesque folk-lore and poetical superstitions associated with various Indian birds.

He gives us a Mahomedan legend that explains how the Paradise Flycatcher came to have its streaming tail feathers. Again, after he has described the ghostly hooting of the Owl, he adds in a whisper: ' When it sits on the top of a native house, uttering this dismal sound, the Devil is walking about inside, marking somebody for death. I know this because the Hamal told me.' But perhaps the quaintest and most poetical of local theories that he has preserved for us is that the little lumps of clay in a Baya's nest are wall-brackets in which fire-flies are stuck for the illumination of the nest.

The price of this book is Rs. 9-8-0 a very modest investment considering the perennial dividend it will pay. The book makes an ideal gift for children: It will help them to grow up with their eyes focussed on the beauty of Nature and their ears attuned to the harmony of life. Its value to ornithologists is of course, inestimable. And next time you are foraging for a birthday present for your gout-stricken but wealthy uncle do give him a copy, for the book is guaranteed to smooth out the creases in the mental make-up of the most crotchety individual and give him many sunny hours.

R. C.

4. THE STORY OF MIGRATION. By E. A. R. Ennion, pp. 97 (10″ × 7½″), illustrated with drawings. London: George Harrap & Co. Ltd., 1947. Price 10sh.

In the preface, the author says that the story is as told to Sheila, who is 17, Hugh 12 and Juliet in between. It is really the kind of book which should be read by all between 12 and 70 and who will all profit thereby—the young because it forms an evolutionary background for the fragments of information which they will be given in schools and the old because many of them will see something which they have missed entirely or seen in such academic terms that they have failed to grasp the charm and simplicity of the story.

It opens with the cooling of the molten earth and the relatively rapid changes in the earth's surface. The first migration is the story of the drift and dispersal of land masses dependent ' on the spinning of the globe, the hammering of the tides, by the pull of the moon and the magnetic poles '.

The world at one stage is a single land mass surrounded by water. This then splits into a northern (Laurasia) and a southern (Gondwana) continent separated by the Tethys sea which ' crept in over Central America, ran between Spain and Mexico, crossed North Africa, Arabia, Persia, Northern India (this was long before the rising of the Himalayas), and wandered out again through China. The continents might possibly arrive at an uneasy truce, if they all lay the same distance from each other, spaced round the globe, and all were of equal weight and make and shape and all equally influenced by outside forces.' The theory of continental drift is still working itself out.

The migration of continents is intrinsically linked with the migration of animals and their present distribution. Australia and Antarctica broke away from Gondwana at a very early time when true mammals had not evolved and in the absence of their competition, Monotremes (egg-laying mammals) and the pouched Marsupials have survived in Australia. There is evidence of this continental drift in innumerable places—the Marsupials in South America and the concentration of Lemurs in Madagascar.

The history of man is also tied up with the changes in the earth's surface. In the first place he was a hunter, mostly of small game—of mice, frogs, shellfish, birds' eggs and wild honey, of roots and berries. His spears and flint axes were no weapons against the mastodons and rhinoceri which then roamed the earth.

When large areas of the earth were covered by ice and deserts came into existence, the larger animals were driven into the areas of the heavier forests and replaced on the open spaces by large herds of sheep, antelopes and camels—

a class of animals which it was easier for man to hunt. These large herds had also to move very considerable distances with the changes in the season, and man, who had now become a seasoned hunter, followed them periodically with the seasons. While civilised man was building churches and workshops, man the nomad, still existed and it was only with the coming of the rifle that the uncounted herds of bison in North America and the antelopes, zebras and other herbivorous animals of Africa were reduced to countable numbers and even threatened with exinction. In India, we have a close parallel in the story of the blackbuck which, within living memory, existed in vast numbers and has now been almost exterminated except in a few private preserves.

There are references and details of the more interesting migrations as of the Lemurs and the Reindeer, the gigantic mammals of the sea, the whales and the seals, and the curious life cycles of the eel and the salmon. Then we have a chapter on the birds of the sea dealing mainly with the curious family of penguins followed by interesting details of the evolution of flight in the different group of animals.

The last part of the book is devoted to the migration of birds with a summary of the present information available. Though they form the most important group of living migrants, the evidence of the origin and formation of this instinct is missing from the book of rocks. Their bones were too small and brittle to survive and most of the fossil remains are of the larger extinct birds which had become flightless through disuse of their wings. Their descendants are the ostriches, the rheas and the cassowaries as well as a few other flightless forms of pigeons (dodos) and rails. With the progress of civilisation, most of them have been killed out and it is said that one man alone, a settler on one of the Australian islands, wiped out a whole species of emu. The Moas of New Zealand, twice the height of the Maoris who hunted them, were not killed out until relatively recent times, as also the dodo.

With the beginning of the Ice Age, the territories occupied by the innumerable species of birds were restricted and the pressure on population increased. During a few months however, large parts of the snow-covered territories were free from snow and ice and brought forth a large quantity and variety of insect and other animal and plant life which had survived the severity of winter by various methods. The time interval was too short to enable mammals to enter and leave this area but birds could travel much faster and they came here relieving the population pressure in the warmer countries, building their nests and bringing up their young. The whole process of reaching the breeding place, staking out territory, building a nest, rearing young, and flying back is governed by an instinct which works with clock-like precision.

In spite of periodic press reports, the actual basis of bird migration, i.e. the manner in which birds find their way from one place to another, is still unknown, nor do we know the mechanism by which this very 'mechanical' process of migration, breeding and return is stimulated and controlled.

There is no doubt that with more facts and figures at their disposal, scientists will be able to take us nearer to the solution of this problem. There is a tremendous amount of work to be done in this direction in India about birds, bats and other migrant animals and it is hoped that many people—both young and old—will read books of this kind so that they may appreciate the value of their every-day observations and take the trouble of placing them on record.

H. A

5. FESTSCHRIFT ZUM 60. GEBURTSTAGE VON PROF. DR. EMBRIK STRAND. (60th birthday commemoration volumes of Prof. Dr. E. Strand)—Vol. iv, Riga (Latvia, U.S.S.R.) 28-5-1938.

Prof. E. Strand, a scientist of international fame and Director of Systematic Zoology, Riga, Lettland, reached his 60th birthday on 28th May 1938. His numerous admirers and friends have communicated many articles which have been compiled and dedicated to him. These communications have been published in 4 volumes and a fifth is expected to follow which would give the register of all the names. Vol. 4 of this Festschrift or Jubilee-Book has been contributed entirely by foreign zoologists and paleantologists. It covers nearly 800 pages with 16 additional plates and 203 figures in the text; the contents are given on page 783 showing a list of 27 contributors. The writers belong mostly to Hungary; next comes Tschechoslovakia; Germany, Austria, Bulgaria, Russia and even Turkey are represented. The language used is almost entirely German.

The names of celebrities who have undertaken to edit the five volumes of Strand-Festschrift are not given but of these editors four expired and their lives appear as brief sketches with photographs; one of them was a lady, the late Prof. Rina Monti of Italy. Another editor, a Russian professor of entomolgy, is reported missing since 1936 and his colleagues in Russia are unable to tell any thing more about him.

It has been said that if the animals on land be divided into insects on one side and the rest on the other, the number of insects would far outweigh the others. It is certain that insect systematists have far more work than others. This is well borne out by the fourth volume of Strand-Festschrift. The largest contribution is by Breuning, being a monographic study of 587 new species of Cerambycid beetles. Of them 7 are dedicated to Prof. Strand, 5 have been dedicated to Mr. Gardner of Dehra Dun and one to Dr. Beeson also from there. A new genus and a new species has been created for an insect discovered at Chikkaballapur which lies in Mysore. Many other new species have been described from India.

Roubal covers a study of 30 pages to thermophilic beetles of Slovakia. A warm country like India offers ample opportunities for such a study and those interested in the problem can well take Roubal's monograph as a model. In about the same number of pages Balogh describes his biosociological studies on Hungarian spiders found in the vicinity of Budapest. Liefke of Hamburg has a monographic study on *Colliurini* (*Carabidae*) covering over 100 pages with 115 figures. Many new species and several new genera have also been mentioned.

The most popular study of animals belongs to that of birds. Their beautiful colours and their fascinating songs have always exerted an irrepressible charm. Others have been fascinated by birds as objects of game. Thus ornithologists usually dominate zoological societies. Auber of Vienna devotes over 100 pages to parrots of the genus *Eos*. Formerly systematists were faced with distinguishing species. Now these have to be subdivided into geographical and biological races, a problem which requires a subtle handling of the material of study. With 35 illustrations on 4 plates and 43 in the text added to the long text the monograph may well be taken as a model study by any one faced with a similar problem. Molitor of Vienna has a long and interesting paper on colour sense amongst hymenoptera. Moczar of Budapest has a long study of wasps of the genus Odynerus covering 37 pages. Kleiner of Budapest contributes to the importance of biotopes in bird migration. For such ecological observations on bird life in India there are ample opportunities but from the literature published in this country it appears badly in need of expansion.

Prof. Terpovsky of Brunn has a small article to widen our knowledge of Molluscs and Dr. Kormos of Budapest on the rodents of Southern Hungary, otherwise the rest of the volume is devoted to birds, insects and spiders.

We wish Prof. Strand a long life! We sincerely believe that there are already in this country several admirers of his but who were unfortunately not in touch with the honorary editors of the Festschrift. For the absence of an Indian name amongst those who have thus paid a tribute to Prof. Strand we beg to apologise.

S. Mahdihassan

EDITORIAL

The chief purpose of editorials in our Journal has been to keep its readers informed of the general activities, plans and policies of the Society as directed by its Executive Committee, and other matters of current interest germain to its aims and objects. Owing to the severity of the paper restrictions imposed by the war this feature had perforce to be suspended. Paper restrictions still continue, now as an aftermath of war, but happily in a less aggravated form. We are thus able in some measure to resume contact with members.

Members' suggestions.

It will be recalled that after the Annual General Meeting in August 1947, a questionnaire was sent round to all members to ascertain their particular interests and obtain suggestions for popularizing the Society and enhancing its public usefulness. Of the 1,000 individuals addressed only 340 members took the trouble to reply ; and of these only 135 had any suggestions to offer. We hope to publish soon an up-to-date list of our members with their addresses. The subjects in which the individuals are particularly interested will be indicated against their names. This will enable members with kindred interests to contact one another, particularly if they happen to be residing in the same district or locality. All suggestions received were tabulated, and their analysis has provided some useful cues to the management.

The principal heads under which the suggestions fall are given below, together with the number of members from whom they come.

1.	Publish non-technical, popularly written and well-illustrated books and booklets on various natural history subjects (also in Indian languages) ...	37
2.	Publish more non-technical and well-illustrated articles in the Journal, such as would appeal to the amateur ...	36
3.	Encourage actively wild life conservation and formation of sanctuaries and National Parks	9
4.	Arrange popular lectures illustrated by movie films and lantern slides	10
5.	Arrange conducted nature rambles and excursions ...	9
6.	Bring together members with kindred interests ...	4
7.	Form sub-societies (entomological and others) and mofussil branches ; also branches for juniors ...	4

The suggestions include award of prizes for natural history essays, teaching of nature study in schools, instruction of nature study teachers in proper methods, guided museum tours for school children, commercial and economic application of zoology, regular popular nature articles in magazines and newspapers, establishment of local museums and travelling museums, preparation of lantern slides and cine films for sale or loan, and many others some practical, others not so practical.

Members will now naturally ask us 'What are you going to do about it ?' We cannot of course hope to satisfy everybody, neither is the Society in a position to undertake too much and all at the same time. But these suggestions have definitely helped to crystallize our plans several of which have already been in some measure of operation. To take item No. 1 which tops the list in popularity—Publications.

Anglers and Fishermen will be glad to learn that Major A. St. J. Macdonald's long awaited 'Circumventing the Mahseer and other Sporting Fish in India and Burma' is in the last stages of printing and should be available by the end of July.

This handy volume, containing as it does much of the information to be found in Thomas's *Rod in India* and other works of that kind, plus much that has not been dealt with before should prove of considerable interest and usefulness to anglers. It is profusely illustrated with black and white plates and four in colour depicting various mahseers.

The price of the book is expected to be Rs. 12 to members and Rs. 15 to the public.

Picture Postcards.

We hope soon to have on sale at the Prince of Wales's Museum a set of 12 coloured picture postcards of Indian birds. These are reproductions of selected paintings from those specially prepared by D. V. Cowen for the 4th edition of the Society's 'Book of Indian Birds'. At the price of Rs. 2/4 per set they seem very good value, and it is hoped that the public will appreciate the publication. If this venture proves successful we hope to publish further sets of birds, as well as of other groups of animals. Members may obtain sets by writing to the Honorary Secretary.

We have plans for expanding as early as may be the Society's Indian Natural History Series to include volumes on Butterflies, Reptiles, Fishes and other groups of animals. The first volume of this series 'The Book of Indian Birds' is already familiar to members, and so is, or soon should be, the recently published Vol. II 'The Book of Indian Animals' by S. H. Prater. Volume III of this series will be 'The Book of Indian Butterflies' by M. A. Wynter-Blyth who is well-known to butterfly collectors and students through his interesting articles published in our Journal from time to time. The manuscript of this book is ready and so are most of the 65 odd coloured and the numerous black and white plates. What we now need are the funds, and to obtain these we have to wait until we can recoup ourselves on the large outlay on Vol. II. The sooner this can be done, the sooner is there a chance of the butterfly book seeing the light. Conditions have changed considerably since the war ended. British and American military personnel then in India were our best customers for natural history publications. With their withdrawal sales have dwindled appreciably, and until we can make our own countrymen nature-minded, the demand for such publications must remain weak and tardy. Therefore we are faced with the important question, How are we to finance our other projected publications?. The answer is obviously that we must obtain an adequate grant-in-aid from the Government of India and the local government. There is no doubt—it has been demonstrated clearly enough in the countries of Europe, and in the United States of America—that nature education and a living interest in, and appreciation of, the natural objects that surround us play a vital role in the cultural well-being of a people. It cannot also be denied that lack of nature education in our schools leaves a void in the life of the Indian child which is hard to fill at a later age. He has not been taught to extract enjoyment and satisfaction from the birds and animals and trees he sees around him. Sooner or later he realizes that Man does not live by bread alone, and it is then often too late to make amends. Therefore there is every reason why the Society must count on Government to come to its assistance in the furtherance of its nature educational programme. An application has been made to the Government of India through the National Institute of Sciences of India, whose good offices we gratefully acknowledge, for a grant for carrying out the Society's publication programme during the next 2 years. This programme includes not only the 'Book of Indian Butterflies', but the first two of a series of attractive colour illustrated booklets on various natural history subjects written in simple English and translated into several Indian languages such as Hindustani (Devanagri and Persian scripts), Marathi, Gujarati, Kannada and Bengali decided on by the Society's Executive Committee at one of its recent meetings. The grant applied for covers in addition a much more ambitious publication, namely, a comprehensive work in 5 volumes on the birds of India under the joint authorship of Sálim Ali and S. Dillon Ripley (of the U.S.A.) fully illustrated in colour and more or less on the lines of Witherby's 'Handbook of British Birds'. In effect this work will be a new edition of Stuart Baker's bird volumes in the 'Fauna of British India' series which was meant largely for the museum worker and which is not only largely outmoded by subsequent taxonomical and field work in India and abroad, but is now also out of print. It is obvious that with the scant interest so far taken in bird study in India an expensive publication of this kind is not likely to prove a commercial proposition, and would only be possible if helped by a subsidy from Government. Apart from its general interest, such a book collating all the data so far recorded on the food and feeding habits of Indian birds is bound to prove of inestimable value in the study of Agricultural and Forest ornithology, comprehensive schemes for which, prepared by the relevant departments are now under the consideration of Government.

2. Regarding item 2 it is fully realized by the Society's Committee and the editors of the Journal that the majority of our membership consists of non-technical or amateur nature lovers widely distributed over the country and outside, with whom the only medium of contact the Society has is its Journal. Therefore, we are for ever striving to find the golden mean between making the Journal too technical or 'highbrow' (as some have dubbed it) for the average reader, and allowing it to descend to the level of an elementary primer or a story-telling magazine. During the 65 years of its existence, the Journal has built up an international reputation and is recognised as the premier scientific natural history publication of the East; it is encumbent on us to see that this reputation as a scientific publication is not only not allowed to suffer in any way, but to do everything possible to enhance it. But while keeping this

goal in view, we fully appreciate that there is a type of scientific writer who revels in employing abstruse and pedantic phraseology and names when he might just as well use others which the not-so-learned reader can readily follow, without in the least bit detracting from the scientific value of his contribution. This is what the editors have constantly to be on the guard against.

Addition of more plates, particularly coloured ones, would certainly add greatly to the Journal's popularity with members and also to its usefulness and attractiveness. But coloured plates mean money, and unless we can improve our revenues appreciably there is slender hope of being able to improve in this direction. Costs of printing and paper have already mounted considerably, and it is as much as we can do to keep within our budget. Perhaps a solution to this difficulty can be found if such members as can afford it will volunteer to donate from time to time one coloured plate (or more) for each issue of the Journal. Each coloured plate inserted in the Journal costs us something like Rs. 350, exclusive of the painting.

Another difficulty experienced in making the Journal 'popular' is that of getting suitable contributions. Many people who *could* write on various subjects with experience and authority do not do so either because they feel that they do not possess the necessary literary talent or that what they have to tell is not worth telling, or has already been told before or, as is unfortunately most often the case, because they are too lazy to do so. This is definitely what we would call anti-social inactivity. We have stressed the point again and again with would-be contributors that no lofty literary attainments are necessary for writing for the Journal. It is essentially a scientific publication and expects only facts to be simply and clearly told. It sets more value on what is told than on the manner of telling it, not that it does not appreciate good writing. We can meet much of the criticism that the Journal does not carry a sufficiency of readable natural history articles if only members will take the trouble to send us notes of anything that has excited their interest or curiosity on holiday treks or shooting and fishing trips, or may be even on their way to office. The Miscellaneous Notes section of the Journal has always been very popular with readers. It will be patent to many that it includes notes varying steeply in their scientific worth, yet all of them are interesting and some even refreshingly controversial. We could expand this section considerably, and with members' co-operation this can be done without difficulty.

4 & 5. What with the day to day administration of the Society's affairs, the work connected with the editing and piloting of the Journal through the press and our other publications, and the management of the Natural History Section of the Prince of Wales Museum, the Curator has his hands completely full. The Honorary Secretary cannot be expected to devote more than a part of his time to the affairs of the Society. Therefore it was realized that if the important and very necessary publicity and educational work was to be done efficiently and effectively it was essential to engage a competent person whose chief business it would be to prepare and carry out schemes for creating public interest in natural history. The Society's Committee considered this question at one of its meetings and decided, as an experimental measure, to appoint a man to take

charge of the proposed activities. As it happened there was a suitable candidate available, and by a happy coincidence we were able to obtain his services without any additional financial burden on the Society. This, however, is only a temporary arrangement and it is hoped that the Government of Bombay, who have been approached in the matter, will appreciate the need of such an appointment and the steps we have taken, and sanction the special grant asked for in order to put the scheme on a permanent footing. It has long been felt that the fullest benefit of our excellent Natural History Museum was not being made available to the public and to schools by our inability to provide proper facilities for instructing nature study teachers from local schools in the correct approach for arousing an interest in natural history among their pupils. Some will perhaps remember the Nature Study Scheme we conducted at the Museum with such marked success from 1926 to 1929 and which had to be discontinued as a measure of economy by the Government of Bombay. A note on this is published in Vol. XXXIII of the Journal (pp. 163-165).

In addition to lecturing and conducting parties through the Natural History galleries, the preparation of simple guide books and the translation of the labels on the exhibits into simple Hindustani (in the Devanagiri script) will be amongst the duties of the Nature Education Organiser. Apart from the immediate benefits the scheme is expected to confer on the public, the Society will thus be doing a bit of long term planning on its own account. In an appendix to the Annual Report for 1946, the Honorary Secretary pointed out what a small proportion of our total individual membership comprised of Indians. Unfortunately it is only too true that the number of Indians who are interested in natural history is infinitesimal. That with suitable opportunities and encouragement Indian children can become just as enthusiastic naturalists as their counterparts in Europe and America was amply demonstrated during the operation of the old guide lecturing scheme referred to. In the plans now proposed, we hope to provide the required opportunities to school children and incidentally to build up a potential membership of the Society in the years to come, thereby insuring its future existence.

3. Col. R. W. Burton's indefatigable zeal and energy and drive might well be the envy of a much younger man. He has written a comprehensive article on Wild Life Conservation and its urgent need in India which we hope to publish in the next issue of the Journal. At the rate our press has lately been turning out the Journal it may be some months after it is due that the August number is published. In the meantime slaughter continues apace and the matter needs urgent attention from the authorities. Therefore Col. Burton had 400 copies of the article printed in pamphlet form for judicious distribution, he sharing the cost with the Society. Copies of this with suitable covering letters from the Society have been sent to the Governors-General of India and Pakistan and to the Prime Ministers and members of the Cabinets of the two dominions. The pamphlet and similar letters have also been addressed to the Governors and Ministers of all the provinces and also to Secretaries, departmental heads, Chief Conservators and Conservators of Forests, Presidents

and various members of the Constituent Assemblies of India and Pakistan and the heads of all provincial legislatures. A special Appeal relating to Reserved Forests, also prepared by Col. Burton, has been distributed among a wide circle of Divisional and other forest officers throughout the country. A precis of the pamphlet prepared by its author has also been widely circulated among newspapers and press services all over the country, and it is confidently hoped that they will attach sufficient importance to the question to give it the widest publicity.

We earnestly hope that the Society's efforts will bear fruit. Indeed it is imperative that adequate measures both legislative and practical, be taken before it is too late. In many instances we fear it is already none too early. The existing legislation for wild life protection is adequate enough on the whole, but some machinery for enforcing the laws is absolutely essential. Therefore Col. Burton's stress on the need for early formation of a competent Department of Wild Life Conservation, whose chief responsibility it will be to see that the law is effectively administered, deserves serious consideration by the authorities. This separate department could work in close co-operation with or even under the existing Forest Department.

Mr. R. C. Morris, another expert on wild life on the Society's Advisory Committee, writes :—

' I am strongly of the opinion that all efforts will be unavailing, as in the past, unless the Education Department, together with the Department of Information, Broadcasting and Propaganda, concentrate on an intensive educative and propaganda drive through the medium of all Schools, Colleges, and Universities; as well as the Cinemas and the Press. If we could get Pandit Jawaharlal Nehru and Maulana Abul Kalam Azad really interested in this I think much can be effected; otherwise very little. I am sure well illustrated pamphlets specially written for the young in simple language, and yet absorbingly interesting even for those of maturer years, such as are published by the American Museum of Natural History and by the London Zoological Society, would go a long way in educating public opinion—especially if supplied to schools, libraries and bookstalls.

I wonder how many of the touring cinemas that tour the villages in the rural areas, show the Ministry of Information and Propaganda's excellent films? *These* are the cinemas the countryfolk chiefly see.

Just as Village Congress Committees conducted propaganda efforts in grain procurement and weaving so their services could be enlisted in propaganda work in respect of conservation of Wild Life.

What should be hammered into the minds of ryots and villagers is that if the deer are all slaughtered the carnivores will turn to man-eating; and that if bird life is decimated the crops and grain stocks will be increasingly destroyed by insect pests, rats, mice, etc.; now preyed on by birds.

Propaganda will be of no avail without emphasis on the *reasons* for the measures suggested.

I consider it is *essential* that (*a*) magistrates should inflict deterrent sentences on poachers and those convicted of offences under the game laws; (*b*) Forest Guards, Watchers, and even Foresters should be made to understand that their jobs depend upon their eliminating poaching in their beats; and the reporting of unlicensed guns; the existence of which in his area every F.G. very quickly learns.

Finally, in areas adjoining Reserve Forests the plea is bound to be advanced that the game damage crops, so must be kept down. Early last year I gave a successful demonstration at a Forest Guards' School, of the use of bamboo rocket-guns, with ordinary bazaar-made rockets of the type bursting at the end of flight, fired horizontally. If such rockets were made available to ryots of forest bordering cultivated areas I think there would be less excuse for killing the deer.'

The Honorary Secretary of the Zoological Society of India sends us the following announcement:—

Zoological Society of India. The following Members of the Executive Council were elected at the annual meeting held at Patna in January 1948:—*President*: Dr. S. L. Hora, *Vice-President*: Prof. D. R. Bhattacharya, *Secretary*: Hony. Major Dr. M. L. Roonwal, *Editor*: Prof. K. N. Bahl, *Treasurer*: Dr. B. S. Chauhan, *Members*: Dr. K. Panikkar, Prof. M. A. Moghe, Dr. B. N. Chopra, Dr. Bhattacharya, Dr. G. D. Bhalerao, Dr. D. V. Bal, Dr. T. J. Job. It is intended to bring out the first volume of the *Journal of the Zoological Society of India* this year. Papers intended for publication, which should either be original contributions or critical reviews of current researches, not published elsewhere, should be sent either to the Editor (at the Zoology Department, Lucknow University, Lucknow, or to the Secretary (at the Zoological Survey of India, Benares Cantonment). Persons intending to become members should contact the Secretary.

MISCELLANEOUS NOTES

1.—HOW FAR CAN A TIGER SWIM?

I shall be much obliged to know what is the maximum distance a tiger has been known to swim. None of the books on the subject enlighten me on the matter. A few of them only refer to the fact that tigers inhabiting the Sunderbans in Southern Bengal have been known to swim pretty long distances.

Let me refer to certain facts which give some idea as to their capacity to swim long distances. I would be very grateful to have your remarks on this incident and shall be pleased to know your surmise as to what could have forced the tigers to swim such great distances. If any of the readers of your Journal have any information on the subject I shall be happy to learn.

The facts are as follows :—

The nearest to Sunderbans one could reach from within the district of Midnapur (my home) was at Khedgeree in Contai Subdivision 18 miles across the river Hooghly, to what is now known as Frasergunj, which is at present devoid of any jungle. But even uptil 1922, while the deforestation was in progress but not complete, tigers crossed this 18-mile wide river with currents and were killed by the villagers at Khedgeree. From 1907 deforestation started at Frasergunj and the Revenue Department started to lease out lands to cultivators. The plan originated from the brains of the late Sir Andrew Fraser, after whom the place is now called. Before 1907 the place was densely wooded and a favourite haunt of tigers. This part of Sunderbans was then known as Mahis Khola Khas-Mahal forests. In the year 1900 a tiger crossed this river and came on to the shore at a place called Horkhali in Tamluk Subdivision in the District of Midnapur and was killed at a village called Deulpata about 14 miles from Horkhali. Now, if the tiger started swimming from Mahis Khola, where the jungle finished, then it would have swam as many as 35 miles before it reached Horkhali. But there was another possibility. The tiger might have walked through thickly populated villages under cover of darkness for 31 miles just on to the opposite bank of Horkhali and then swum across the Hooghly, which is about 6 miles wide at this point. Having achieved this it might again have walked 14 miles to Deulpata, where it was found early in the morning and killed by one of the nephews of late Hon'ble Mr. Nilmoni Mandal, the local Zamindar.

Either of the above feats would seem, at the outset, to be impossible for a tiger, but I have related the bare truth.

HAMPTON COURT,
HAZARIBAGH (BIHAR),
19*th October*, 1947.

D. P. GARGA,
Kumar of Mahishadal.

[Tigers have been shot on Bombay and Salsette Islands, which they must have reached by swimming across the Thana Creek or

Bombay Harbour. A list of records ending with one at the Vihar Lake in 1929 is published in *J.B.N.H.S.*, Vol. xxxiii, p. 973. This reads in part 'On March 2, 1858 the crew of the steamer *Aden* killed a large tiger which was swimming across to Mazagaon from the opposite shore.' The *Bombay Courier* also records the sudden appearance of a tiger at Mazagaon 'the animal apparently swam across the harbour and landed near the ruined Mazagaon fort'. This is roughly seven miles from the nearest point on the mainland.—Eds.]

2.—AN EXTENSION OF THE KNOWN RANGE OF *BANDICOTA NEMORIVAGA* (HODGSON) IN CHINA

The only record of the Smaller Bandicoot Rat, *Bandicota nemorivaga* in China appears to be from Tengyueh, in extreme south western Yunnan (vide The Natural History of Central Asia, Vol. XI, The Mammals of China and Mongolia, Part 2).

I record here a very interesting extension to the known distribution of this species in China, namely, from the Colony of Hong Kong. During the months of April to July, 1946, about one dozen specimens were trapped in the fields at Un Long in the New Territories, Hong Kong. A single specimen was also trapped at Taipo in the New Territories. After my departure from Hong Kong in July, 1946, I received the skull of a specimen obtained by the Rodent Control Inspector from the Aberdeen district of Hong Kong Island itself. The identification of this skull has now been confirmed by Sir John Ellerman at the British Museum (Natural History) in London.

Since it is unlikely that the distribution of this species has been extended via the medium of shipping routes, these records of its occurrence in China from two such widely separated localities cause me to doubt very much that it does not occur over a much wider range in southern China.

I publish this record by kind permission of the Hon. Director of Medical Services, Hong Kong.

Medical Department,
Hong Kong,
23*rd September*, 1947.

J. D. ROMER, F.Z.S.,
Rodent Control Officer.

3.—ALTITUDINAL LIMIT OF THE INDIAN ELEPHANT

While crossing the Bompu La (9,600′) in early September I was surprised to find fresh traces of a number of elephants on the very summit, and to learn that one had actually been encountered on the path a few days before. The Bompu La is in the Se-La Subagency of the North-East Frontier of India lying some 30 miles east of the eastern boundary of Bhutan. The range whose highest peaks are over 10,000′ rises straight from the plains and the southern base is covered in evergreen forest. Above 9,000′ this becomes a dense growth of Ringal Bamboo under a cover of Rhododendrons and other evergreens and it is apparently this bamboo which attracts the elephants during the summer months only, since from December to February the Pass is regularly under snow.

I should be very interested to learn the record altitude at which the Indian elephant has been found.

N. Lakimpur, F. N. BETTS,
Assam. *Political Officer,*
23*rd October* 1947. *Subansiri Area.*

[Prater in *The Book of Indian Animals* (p. 186) says, 'In Burma they wander at all seasons of the year into bamboo forests at a height of 10,000 ft., while in Sikkim their tracks have been seen in the snow 12,000 ft. above sea-level.'—Eds.]

4. THE MOVEMENTS OF THE ROSY PASTOR IN INDIA

With reference to the paper by Mr. Humayun Abdulali published in Vol. 46, No. 4 of the Journal, I am writing in the possibility of being able to fill a small gap in the records collected from Rajputana.

The area covered by my observations was the line of the B. B. and C. I. Railway from Abu Road to Ajmer and the period was 1929–1933.

Normally large flocks of immature birds would be observed about the middle of July, but in 1933 when there was unusually early rain, the first flocks were noted at the end of June. I was not able to observe any particular directional trend in the movement of these flocks and their wheelings seemed to be quite aimless.

The birds were present throughout the cold weather, but in smaller numbers (apparently) than during July–September.

In March flocks of birds in mature plumage were busy feeding and sunning themselves in *Butea frondosa*, wild caper and a shrubby tree locally known as 'pilu' (*Salvadora persica*) of which the fruit-bunches of small purplish black berries—were then ripening. During this period their cheerful murmuration was to be heard almost everywhere that these trees and shrubs were to be found.

By the end of April they had all gone.

1 B, Imperial Mansions,
Cuffe Parade, Colaba, Bombay, 5. R. M. SIMMONS
7*th November*, 1947.

5.—OCCURRENCE OF THE SPECKLED PICULET [*VIVIA INNOMINATUS* (BURTON)] IN KHULNA, BENGAL

Having secured on 28th September, 1947, from a local birdcatcher a live specimen of *Vivia innominatus* (Burton) it will be at this stage out of place to record anything more than that the locality where it was spotted and captured lies in Khulna on the eastern bank of the river Bhairab opposite Daulatpur. A considerable patch of bamboo clumps abounding there seems to be the favourite resort of the bird, where in fact it was caught with bird-lime. Any further details regarding its occurrence and habitat in Central and South Bengal must await my opportunity of a personal visit to the area and first hand encounter with the bird. I am inclined to mention, however, that this birdcatcher, having seen in my aviary some live examples of the Speckled Piculet (captured from the forests of Buxa Duars), told me several times that he had sighted it more than once during his periodical birdcatching trips to Khulna.

The specimen being devoid of tail feathers has to be kept under special care. *Measurements*: Wing 52 mm.; tarsus 12 mm.; culmen 11 mm. *Sex*: Apparently female as it has the whole crown olive.

Incidentally it may be noteworthy that some Himalayan species, e.g. *Mixornis gularis rubricapilla* (Tickell) and *Malacocincla sepiaria abbotti* (Blyth) do occur in the jungles of Khulna and Jessore (*Ibis*, 1945, pp. 405–408).

SATYA CHURN LAW, M.A., Ph.D., F.N.I.

50, KAILAS BOSE STREET,
CALCUTTA,
20th November, 1947.

6.—THE CLICKING NOISE MADE BY OWLS

On page 542 of the IBIS, 1939, Pakenham states that a series of clicks—'tac-tac-tac'—produced by *Otus pembaensis* (Pemba is near Zanzibar) was not with the mandibles but from inside the mouth.

In Vol. 40 of the Journal (page 368) we have recorded the Striated Scops Owl, *Otus brucei* (Hume) as making a sharp noise by clicking its mandibles when annoyed, and I have another note on *Strix ocellata* making a loud clicking noise when handled.

This appears to be fairly common among owls, and it would be interesting to obtain more opinions as to how this noise is produced.

75, ABDUL REHMAN
STREET, BOMBAY, 3.
October 30th, 1947.

HUMAYUN ABDULALI

7.—GREEN PIGEONS IN A SWAMP

Reference Major E. G. Phythian-Adam's note in Volume xliv, No. 1, August 1943. For the last two seasons in the hot weather (March-May) I have noted the Grey-fronted Green Pigeon (*D. pompadora*) visiting the lower end of some paddy-fields near here, where they were still moist. They had been cultivated but there were also one or two uncultivated patches. Which of these the birds visited I could not ascertain. I shot one bird that came out of a tree nearby and it undoubtedly contained mud in its crop.

KURADY KHAN ESTATE,
SANGAMESWARPET P.O.,
KADUR DISTRICT, G. V. R. FREND
(MYSORE STATE).
October 20th, 1947.

[That, contrary to the old belief, Green Pigeons do descend to the ground to drink is now sufficiently well known to need comment. Observations are invited as to whether they and other birds eat the earth at salt licks in the same way as deer and most mammals do.

We have frequently observed jungle mynahs flying out to little rock pools on the seashore left by the receding tide, and drinking salt water (presumably as an aperient ?), and it is probable that when salt water is unavailable, the damp earth of salt licks may be swallowed as a substitute.—EDS.]

8.—PECULIAR BEHAVIOUR OF THE DARTER (*ANHINGA MELANOGASTER* PENNANT)

In October, 1939, I was fortunate enough to visit the famous Keoladeo Ghana in Bharatpur and among many other curious and wonderful sights, we noticed that Darters which were fairly common on the babool trees overhanging water, would, when approached, let themselves drop plumb into the water with closed wings, as if shot dead, knocking against the branches as they fell. They would also fly out of the trees and then suddenly flop into the water and disappear below without any preliminary hovering in the air or alighting on surface as is usual among other such birds.

I was reminded of this note when I recently saw a pair of Darters perched on a Jamun overhanging water at the Powai Lake near Bombay, drop in similar fashion.

This therefore appears to be a widespread habit though I cannot recollect having seen it published before.

MESSRS. FAIZ & CO.,
75, ABDULREHMAN ST.,
BOMBAY, 3. HUMAYUN ABDULALI
October 30th, 1947.

[This habit is recorded on p. 387 of *The Book of Indian Birds* (4th edition).—EDS.]

9.—WILSON'S PETREL IN INDIA

James Fisher in his delightful Penguin Book 'WATCHING BIRDS' (page 107) mentions Wilson's Stormy Petrel, *Oceanites oceanicus*, as 'one of the most numerous species of birds in the world, huge flocks passing into the Atlantic, Pacific and the Indian Oceans during the off season'. In the IBIS for 1929, page 41, H. G. Alexander records seeing this bird on 10 September, 'about 150 miles out from Bombay and also common in the Gulf of Aden'. There is however no record from India, except for one collected by Butler off the Mekran Coast, and as 'a visitor to the coasts of Ceylon chiefly during the S.W. Monsoon' (Whistler, Spolia Zeylonica, 23, page 289).

On the 21 October, through the courtesy of the Fisheries Department, I had the opportunity of going out on a short shark-fishing trip on the Government trawler 'TAPASE'. We left Bombay near midnight and anchored about 6 miles off the Janjira shore, where several hundred hooks were cast overboard. These were drawn back at sunrise with no result, but during the return to Bombay during daylight, we continually saw one or two small dark petrels with square tails and white rumps. Though many shots were fired, we failed to get one, until just as we were entering Bombay harbour, a flock of 8 or ten birds (the only flock seen) permitted us to approach within range, and one was secured and identified as this species. Witherby in a footnote on page 39, vol. 4 of Handbook of British Birds, admits the four races described by B. B. Roberts (British Graham's Land Expedition of 1934–1937, Scientific Reports, Vol. 1, No. 2, page 141/194, British Museum, 1940), but states that due to the large overlapping in measurements and in the absence of any plumage differences it would not be practicable to assign the birds obtained in England to any particular race. I am therefore recording the measurements and leaving the name binomial. Wing 145 mm., bill 18·5 mm., tail 59 mm., tarsus 35 mm.

The frequency with which this bird was noticed only six miles out at sea raises an interesting question. Was this exceptional or are they always present at this season in such numbers? It would be extraordinary indeed if it should have been so near us all these years and never recorded.

This petrel is a small black bird, reminiscent of a swallow, only slightly larger, with a square tail and a white rump. The feet have yellow webs and extend beyond the tail in flight. We also saw these birds pattering over the surface, i.e. practically walking on water, in a series of hops, and it might be interesting to recall that the word Petrel is derived from St. Peter (Matthew 14 : 29).

BOMBAY, HUMAYUN ABDULALI
December 20, 1947.

[Dr. C. Gibson-Hill of Raffles Museum, Singapore, to whom the specimen was sent for examination, writes:

'It is very probably the race *parvus* Falla, from Kerguelen, but one cannot be a hundred per cent sure with a bird taken at sea. The differences between the subspecies are very slight, and to some extent they overlap in their measurements.'

Sinclair in 'Waters of Western India' says that Mother Carey's Chicken 'is known but rare' off the Konkan Coast (*J.B.N.H.S.*, Vol. I, p. 167) and also mentions it as occurring off the Sind Coast (*J.B.N.H.S.*, Vol. 3, p. 7). Phillips records it frequently on a trip from Aden to Karachi (1st to 7th July) and he last saw it within sight of Karachi (*J.B.N.H.S.*, Vol. 46, p. 613).—Eds.]

10.—OCCURRENCE OF THE SNAKE *POLYODONTOPHIS SAGITTARIUS* (CANTOR) NEAR BOMBAY

On the 13th November, when I was shooting with Messrs. H. B. Hayes and F. Sharpe around Ambernath (Kalyan District), we picked up a small snake which has been identified at the Society as *Polyodontophis sagittarius* (Cantor's Polyodont) (length 11½"; 205 ventrals, 8 supra-labials).

This is not mentioned in Prater's list of the Snakes of Bombay Island and Salsette (1923), though older specimens from Poona (G. W. Vidal), Salsette, Lonavla (J. P. Mullan), Nagpur, Jhansi and Cannanore (F. Wall) are listed on the card catalogue of the Society's collection. The *New Fauna* restricts the distribution to 'North Eastern India from the Central and United Provinces to Eastern Bengal. Wall records it from the Western Himalayas'. ('As far west as Chamba', Wall, *J.B.N.H.S.* xxix, p. 599.)

c/o Messrs. Faiz & Co., HUMAYUN ABDULALI
75, Abdul Rehman Street,
Bombay, 3.
November 19, 1947.

11.—CROCODILES BELLOWING

With reference to the two notes on the above in Vol. 45, one by Major R. K. M. Battye (pp. 93/94) and the other by Lt.-Col. H. G. Rossel (pp. 428/29), the following extract from 'The Reptiles of North America' by Raymond L. Ditmars (Doubleday & Co., Incorporated, New York—1946) relating to the Alligator [*A. mississipiensis* (Dauden)] may be of interest.

'Among reptiles the alligator is unique in giving voice to a loud noise or 'bellow'. In the southern swamps the night air carries the call of a large individual for a mile or more. The 'bellowing' of an alligator is hard to describe, as it varies greatly in cadence according to the size of the reptile, from a sound like the gentle 'mooing' of a cow from a small alligator of about five feet, ranges to the thundering and tremulous blast of a big male—ten feet or more in length. As the patriarch gives voice to his roars the scent glands on the undersurface of the chin, are opened, and fine steamy jets of a powerful, musky-smelling fluid float off into the heavy miasmatic atmosphere of the bayou. The odour may be carried for miles and to the negroes it always signifies 'a big ol'gator'.

BOMBAY, HUMAYUN ABDULALI
15*th November*, 1947.

[Hamilton in 'Wild Life in South Africa' p. 315, says that crocodiles 'when angry, hiss like most other reptiles. At other times they utter a fairly loud throaty noise'.—EDS.]

12.—NOTES ON A FEW REPTILES FROM THE NILGIRI HILLS

During a leave I collected a few reptiles in the Nilgiri Hills and some points of interest are here noted. The notes are written with reference to the account by Malcolm Smith in *Fauna of British India*, 2nd edition.

SAURIA

Cnemaspis gracilis Beddome.

1 ♀ in a cairn of stones, Kotagiri-Mettupalayam road milestone XI, 6-12-45, contained two eggs.

Cnemaspis jerdoni. ? Theobald.

1 juvenile, Elk Falls, body 18 mm., under log, 8-12-45. About the same time a number of gecko eggs were found below large boulders at Catherine Falls.

Calotes versicolor Daudin.

1 specimen, Kotagiri, the dorsal row of scales ran straight down onto the middorsal line of the tail.

Psammophilus dorsalis Gray.

6 specimens were collected on Windy Gap Hill, Kotagiri, 3♂♂, 3 juveniles. The general appearance was blackish. Top of head nearly black; back olive grey; 5 black ringed white spots on sides of largest ♂; from lips down side olive band changing sometimes to brick red; belly slightly golden; tail black and white bands. The colour was changeable quite markedly.

Riopa punctata Gmelin.

1 specimen caught with *C. gracilis*, 28 scale rows at midbody

SERPENTES

Plectrurus perottetti Dum. & Bib.

1 specimen Windy Gap Hill, Kotagiri, 5-12-45. V. 162, C. 7. Ground colour purplish brown, slight brick red spot at each corner of the mouth, brick red under tail, narrow brick red line on dorsal surface of tail.

Elaphe helena Daudin.

1 specimen, 14-12-45, near Kotagiri, V. 235, C. 91. Light olive ground colour, 9 black bands with white ocelli, expanding ventrolaterally, linked by black loops on belly, no longitudinal stripes on belly.

12 GIRDLER'S ROAD,
BROOK GREEN,
LONDON, W. 14.
GARTH UNDERWOOD

13. ACACIA THORN IN THE STOMACH OF A TOAD (*BUFO MELANOSTICTUS* SCHNEID.)

Among a number of toads supplied for dissection in the class, a fully grown female toad (*Bufo melanostictus* Schneid.) measuring about 95 mm., distended with ripe eggs was found to have swallowed a biradiate Babul thorn (*Acacia arabica* Willd.) The two arms of the thorn were at right angles to each other within the stomach and measured 22 mm., and 20 mm. One of the pointed ends of the thorn rested freely against the middle region of the muscles overlying the parasphenoid in the buccal cavity and the other arm of the thorn had penetrated through the oesophagus right into the left urinary bladder. Due to this, the oesophagus had become greatly dilated so as to present little difference between the oesophagus and the stomach in size. The wound caused by the penetration of this thorn appeared to be completely healed up. On opening the stomach, I noticed bits of food such as cuticles and muscles of insects. This indicated that the toad was apparently without any discomfort and probably was leading a normal life. The swallowing of the thorn by the toad seems to be purely accidental.

I am indebted to my student Mr. Suresh Chandra Das for first drawing my attention to the above and to Dr. J. L. Bhaduri, D. Sc. (Edin.) of the Department of Zoology, University of Calcutta, for his valuable suggestions and criticisms.

MAHARAJA'S COLLEGE,
PARLAKIMEDI,
GANJAM, ORISSA.
BASANTA KUMAR BEHURA

18th November, 1947.

14. MARCH LEPIDOPTERA AT GOPALPUR (DIST. GANJAM)—A CORRECTION

In a short note in this Journal (1940, vol. xlii, 21 1) I published a list of the Lepidoptera observed at Gopalpur during a short holiday in March 1940. Setting the specimens then collected recently has revealed an error. The list included *Spindasis ictis* Hew., *ictis*, this is incorrect—the actual species being *Spindasis vulcanus* F., *vulcanus*.

LONDON,
November 10*th*, 1947.

D. G. SEVASTOPULO, F.R.E.S.

15.—ON THE BUTTERFLY *DELIAS DESCOMBESI LEUCACANTHA* FRUHSTORFER

I do not remember having seen any detailed description of the larva and pupa of the butterfly *Delias descombesi leucacantha* Fruhstorfer. I have recently been lucky enough to obtain two broods of larvae which I have successfully observed.

Both broods were found on a *Loranthus*, which has been provisionally identified by the Forest Department herbarium at Shillong as *Loranthus ligustrinus* Wall. at a height of some 20 feet from the ground. Both broods were gregarious in that the larvae remained together on one large growth of *Loranthus*, although there were other growths of the same species very close by. The larvae were usually scattered in groups of 3 to 10 amongst the leaves but occasionally a single larva was noted feeding by itself. It was usual for each group to feed or rest all at the same time. While resting the larvae usually did so at the end of a twig in a large bunch overlapping and entwined together with their heads towards the main stem.

The larva is lemon yellow in colour with very sparse fine short yellow hairs. The head is black and the spiracles are also black. It tapers very slightly towards the head and tail giving it a somewhat hump-backed appearance when resting.

The first brood was found on 15-9-47 and the second a day later. All the larvae were almost full fed and had all pupated by the 20th. They fed voraciously while under observation. When ready for pupation the larvae usually crawl down the trunk of the tree and set for pupation in large groups on the under surface of large leaves either belonging to the parent tree of the Loranthus on which they have fed or on nearby bushes. It was also however noticed that some larvae let themselves down on long silk threads and pupated singly under leaves in nearby undergrowth. 64 pupae were obtained from the first brood and 79 from the second brood. The ground colour of the pupa is a dark pinkish yellow with short black spines along the dorsal ridge. These spines number six on each pupa. There are three further spines at the tornal angle of the wing cases on either side, the central spine being longer than the other two. The cremaster is black with a few black marks and spots at the anal end of the pupa. There are some diffuse brownish marks on the dorsal surface of the head which has a pronounced keel which is brownish. The head terminates in a projecting black spine. The wing cases are of the ground colour with the veins broadly outlined with short dark brown stripes, while there is a thick very dark brown stripe at the base of each wing case. The legs and eyes are outlined in brown and the antennae are outlined with a line of fine brown dots but the clubs of the antennae are not indicated.

The silk girdle of the pupa is very fine and rather loose so that the pupa often attains a curious misshapen angular attitude when in an upright position. The silk is white and very tough indeed and there is some indication that it is also occasionally used to fasten the leaf to the stalk when the larva is about to pupate. This was done by the larvae of the first brood which were brought indoors to pupate; but there was no indication of this procedure having been adopted by the second brood which were allowed to pupate under natural conditions.

Mortality in the larval stage seems to be low since I only lost three from the first brood which were kept in captivity. Mortality in the pupal stage and after the larvae have set for pupation on the other hand is very high. It was noticed that in a number of cases after the larva had set for pupation that they became discoloured after about 36 hours, then began to sag badly in their girdles and finally putrified. The healthy larvae on the other hand remained a clear yellow colour; a period of up to three days elapsing from the time the larva set to the time of the formation of the pupa. This pre-pupal mortality was noticed equally in the captive brood and in the brood which was left in a natural condition.

Mortality in the pupal stage was also very high but only in the brood which was left in its natural surroundings. Only two pupae were lost in the brood kept in captivity but at least 35% of the brood kept out of doors died in this stage. The unhealthy pupae turned dark brown all over and sagged at an angle in their girdles inertly, finally going almost black and putrifying. Several of the dead pupae were closely examined at intervals but no trace of any parasites was ever found. The cause of this mortality was therefore unexplained but may possibly be a natural method of limiting the numbers of the species to the available food supply, since I have, on two occasions previously, come across two very large broods of pupae of this species all of which were dead with the perfect insect fully formed inside, not a single specimen having emerged alive. It was further noticed that some of the pupae were much darker in general appearance than the others, and when they began to emerge these proved to be the females. The second brood was also brought indoors after they had pupated.

The species appears to have no natural enemies since I have never seen the perfect insect being attacked by birds or other enemies and although the larvae are conspicuous they do not appear to suffer. This apparent immunity may, however, be due to the fact that the food plant makes both larva and perfect insect poisonous.—[? Eds.]

The perfect insects began to emerge on 29/9/47 and all had emerged from both broods by the 1st of October. The usual time of emergence was in the early morning before 8 a.m.

All the specimens obtained from the first brood were of the typical form and no individual variation was noticed either among the males or the females.

With regard to the second brood however, while the males were all of the typical form the females showed considerable variation from the typical form. Two specimens are referable to form *auriga*, Seitz and several others appear to be intermediate between this form and the typical form, the under surface of the hind wing of *auriga* being a much darker yellow and much more heavily dusted with black than the typical or intermediate forms. The remainder of the females from the second brood showed very great differences from descriptions I have so far come across or specimens so far seen by me. The upper surface is intermediate between the typical form and the form *auriga*, the veins of the fore wing being slightly more broadly white-grey than typical *auriga* while the hind wing is less yellow. The under surface of the hind wing, however, is quite different from either the typical form or *auriga*. The ground colour is white with a scarcely noticeable basal yellow tinge and the black discal dusting is very greatly reduced.

These specimens appear to represent an undescribed form of the female for which I propose the name *semialba*, nom. nov. The almost complete absence of the usual dark yellow discal colouring on the underside of the hind wing in these specimens gives them a curious pallid appearance.

It is noteworthy that the larva of this species very closely resembles that of *Delias hypartete* the only difference, according to the description in Seitz, being that the larva of the latter species has black legs and anus.

It is necessary also to note that while *Delias descombesi* appears to pupate in groups, sometimes as large as 25–30, I have never noticed this habit in respect of either *Delias belladona ithiela* Butler in the Himalayas or *Delias agostina* Hewitson in the Khasi Hills, pupae of which I have always found singly on the under surface of leaves and bushes at the foot of the trees on which the larvae have been feeding.

HAFLONG, R. E. PARSONS, F.R.E.S.,
NORTH CACHAR HILLS, *Indian Police.*
ASSAM,
October 22nd, 1947.

16. EARLY STAGES OF THE BUTTERFLY *DELIAS AGLAIA* LINN.

I have recently obtained two broods of the butterfly *Delias aglaia*, Linnaeus and a short note on the larva and pupa of this species may be of interest, more particularly as it involves a correction to the description of the larva published by Seitz in Vol. IX, page 133 of his 'Macrolepidoptera of the World'. Seitz mentions that the larva is red, each segment with long hairs of which the lateral ones are black and the dorsal yellow. This description does not tally with the larva found by me, which was dark red with bright yellow bands approximately one millimetre in width which gives the larva a banded appearance, in which the red bands are approximately 2½ times as wide as the yellow bands. The long hairs mentioned by Sietz are present but are very sparse indeed. The head is black.

One of the broods found was in the pupal stage and the other was in the larval stage, all the larvae being in the last instar. The food plant in each case was a small narrow leaved *Loranthus* growing low down. It was noted that *aglaia*, unlike some of the other species of *Delias*, forms its pupa on the leaves of the food plant in twos and threes which is quite different from the habits of *Delias descombesi leucacantha* Fruhstorfer, for instance, which pupates in large groups on the undersides of large leaves at the foot of the tree on which the food plant is growing. Unfortunately almost all the pupae of *aglaia* found in this state were parisitised by a small wasp-like fly, black in colour, as yet unidentified. The brood found in the larval stage was, however, successfully reared. The pupa is about ⅝ the size of that of *Delias descombesi leucacantha* and is very dark brown indeed so as to appear almost black. The coloring is however somewhat lighter towards the anal end. There are five blackish dorsal spines on the back gradually decreasing in length towards the anal end. In addition there are five small spines at the tornal angle of each wing case, the central spine being much larger and thicker than the others. These tornal spines are whitish. The head of the pupa is not so prominently keeled as that of *Delias descombesi leucacantha* and the spine (which is black) which terminates the pupa at the head end is also much shorter. The pupal stage lasts for 17-18 days, at this time of the year. All the perfect insects obtained from these two broods were of the typical form except one which was aberrant. In this specimen the white discal patch between veins two and three on the underside of the right fore wing is entirely missing while the tornal white patch immediately below is greatly reduced in size and thickly dusted with black scales. The white patch in the cell on the underside of the same wing is also reduced in size. The underside of the left fore wing is quite normal and the uppersides of all four wings are normal. The specimen is a female of normal size.

HAFLONG, R. E. PARSONS, F.R.E.S.,
NORTHERN CACHAR HILLS, *Indian Police.*
ASSAM.
10*th December* 1947.

17.—SHAMMING DEATH

Col. Burton's experience with jackal is precisely the same as my own, when hunting these animals with dogs. Nor did I ever hear the jackal give a death cry: but this was not to be expected, as the animal was not on the point of death. I have always ascribed the behaviour of insects to be one of pure instinct: to 'freeze' and remain motionless often on the slightest disturbance, without the insect actually being touched. These are very different conditions from the jackal who is having a horrible time of it, and hopes to avoid further punishment by pretence of death.

There is certainly no previous record of anyone having heard the tiger's death cry and I doubt if it has ever previously been heard by anyone having the necessary qualifications to interpret what was happening and the significance of the noise.

When one considers the enormous strength and vitality of the tiger, with his tremendous tenacity of life, merely to contemplate on his death cry, his protest against his departing spirit, is in itself awe-inspiring, and Col. Burton is to be envied over his experience.

SCOTLAND, A. A. DUNBAR BRANDER
October 6, 1947.

[Hamilton in 'Wild Life in South Africa', p. 286, refers to a slightly wounded Giant Owl (*Bubo lacteus*) which shammed dead for two days, being carried about and freely handled. It walked away one night, and when found 50 yards away it resumed dead!—EDS.]

18.—ANIMALS 'SHAMMING' DEATH

In Vol. 46, No. 2, Mr. Dunbar Brander, the well-known naturalist, says in his letter entitled, 'Shamming Death', that animals have no knowledge of death. Question of time is infinity to them. But my idea is not that. If they do not realise what death is, they certainly preconceive a danger. I do not mind if you term it 'Instinct'. But how can instinct tell goats that one is going to be slaughtered and the other is not when both are led along in the same fashion? The one which is not going to be slaughtered will in all probability follow without any sign of resistance, but the other requires to be hauled. He gives out successive cries and shows resentment. I know cases and also I say from my experience that when chickens are tamed they can ordinarily be caught without any difficulty, but before slaughter the same will invariably fly and run about and refuse to be caught.

2. With regard to death-cry of animals Mr. Dunbar Brander rules out excessive fear being the cause of it and questions whether it is instinctive. I would rather rule out both and am inclined to suggest —it is the outcry of agony and excessive pain that precedes a violent death. If some one says that when an animal gets a sudden shock all its nerves are benumbed and it does not feel the death-agony, I would then attribute this cry to unexpectedness of the stroke or hit rather than call it instinctive. The hit startles the animal to such an extent that

it gives vent to a succession of cries which are never uttered under ordinary circumstances.

PHUL-BAG PALACE,
MAHISHADAL,
MIDNAPUR DT.
June 6, 1947.

D. P. GARGA,
Kumar of Mahishadal.

[Mr. A. A. Dunbar Brander, to whom the above note was submitted, comments as follows:—'Animals possess very strong instincts and very acute perceptions with regard to *danger* and unless special precautions are taken, it would be apparent to the animal that some design with respect to itself was contemplated. But can this consciousness of *danger* be extended so as to include consciousness of *death* itself? Personally I believe not, and all my experience of animals is that they are not conscious of death, in other words of time; to them their life appears infinite. Be it fully understood that I merely express an opinion, I have no certain knowledge on the subject, and my original letter was written with the object of inducing a correspondence which might throw more light on the subject.

That the death cry is due to fear, or excessive pain or agony I am in a position to deny factually. Much more painful wounds than an actual death wound, are frequently endured by animals in silence. The death cry is never uttered save immediately on the point of dissolution: it is intimately connected with death itself. I recollect smiting a noble stag through the heart with a ·577 bullet. He was quite unware of my presence, had no fear, anticipated no danger. He stood up on his hind legs extending himself to his fullest extent, pawed the air with his fore legs and letting out a heart-rending death cry, fell dead. As most of your readers are probably aware, the usual procedure under such circumstances, is for the stag to gallop blindly forward for 50 yards or so and then fall dead. But what I have related above happens now and again.

Does the desire to preserve its life necessarily imply that the animal is conscious of its ultimate death? The discussion on this point is in the realm of philosophy rather than that of natural history.'—EDS.]

19.—THE INFLUENCE OF MIGRANT BIRDS ON BUTTERFLY MIMICRY

I was pleased to see from Mr. Wynter-Blyth's note on *Valeria valeria hippia* (Fabr.) ♀ form *philomela* (1947, *Journ., Bomb. Nat. Hist. Soc.*, 46 : 736) that, at any rate as far as this species is concerned, both he and Mr. Sálim Ali share my doubts regarding the correctness of Rosa's theory that the two members of a pair of Batesian mimics need not necessarily fly together but may be found at the opposite ends of the range of a migrant species of insectivorous bird.

It is unfortunate that my two short papers criticising this theory (1939, *Entomologist*, 72:222 and 1940, *ibid*, 73: 191) were published after Talbot's *Fauna* volume had gone to press, and the impression was therefore given that the theory had not been disputed. As all these papers were published in the *Entomologist* and, although they concern Indian insects, may not be generally available to entomologists working in India, it may be worth while giving a brief summary of them here.

In the *Entomologist* (1937, 70 : 32), possibly as a result of his collecting trip to India a few years earlier, Rosa published, under the title 'The Influence of Bird Migration upon the Distribution of Mimetic Species of Lepidoptera', a hypothesis that the two members of a Batesian pair need not necessarily fly together but might be found at the opposite ends of the range of a migrant insectivorous bird. Three pairs were cited as examples—the *romulus* Cr. form of female of *Papilio polytes* L. and *Polydorus hector* L., *Aporia agathon* Gray and *Danaus nilgiriensis* Moore, and the ♀ form *philomela* F. of *Valeria valeria* Cr. and *Danaus aspasia* F.

In my first reply I pointed out that it would generally be conceded that, provided a mutant was not actually harmful, once it had occurred and established itself in one part of a species's range, it would gradually diffuse throughout the species's entire contiguous habitat. This is what had obviously taken place in the case of *polytes* and *valeria*. In the third example, *A. agathon* and *D. nilgiriensis*, I considered the true model to be *Delias sanaca* Moore, or possibly another of the black and yellow *belladonna* F. group, which occur in the same district as the mimic.

Rosa in his reply (1940, *Entomologist*, 73 : 66) drew attention to minor points that I had not touched on, admitted the spread of a mutant through diffusion, and migration but entirely ignored my criticism of his *agathon-nilgiriensis* pair.

In my final reply, I suggested that any selection exercised by the migrant bird would be entirely nullified by the indiscriminate feeding of the resident species, which would not be acquainted with the model; and there the discussion ended.

The spread of a mutant through diffusion depends on its genetic constitution, many mutants being weaker than the type, and on whether it is at a disadvantage to the type form in the struggle for existence. If it is at no disadvantage and if it is a vigorous form it will spread, and this is undoubtedly what has happened in the case of the *romulus* form of *polytes* and the *philomela* form of *valeria*. The fact that both these are sex-linked forms, being carried by, but not appearing in, the male would also tend to reduce any tendency to delay diffusion through slight unfavourableness. In *polytes* we have a powerful and conspicuous insect, which is hardly likely to suffer severe losses from the preying of insectivorous birds, whatever its form, and the habit of the female of flying in and out of bushes is likely to be an added protection, as birds large enough to eat it are unlikely to be able to follow and catch it, so that it is safe to say that the spread of the *romulus* form in areas where *hector* does not occur could not be harmful to the species in any way. In the *valeria-aspasia* pair, I think that, concentrating on the close mimicry between *philomela* and *aspasia*, sight has been lost of the general Danaid appearance. Of recent years the emphasis in the mimicry theory seems to have shifted away from the very perfect and exact mimics towards the species which exhibit a more general type of mimicry, sufficient it is thought to make a predator hesitate for an instant in its attack and thus allow the mimic to escape. Even to a bird unacquainted with *aspasia*, *philomela* must appear sufficiently like one of the small black and pale blue, or white, Danaids to produce this momentary hesitation, and the presence of the yellow on the hind wing cannot be harmful to the species. Richmond Wheeler (1944 *Entomologist's Record*, 56 : 90) denies that the females of this genus are mimics of *Danaus* at all, but this question is outside the scope of this present note, and I do not think many entomologists in India will be found to agree with him.

London, 9. x. 47 D. G. SEVASTOPULO, F.R.E.S.

20.—COLOUR SENSE IN NATURE

(*Reprinted, with acknowledgments, from 'The Field' of 6th September, 1947.*)

'Are many animals colour-blind?' The difficulty of questions like that is that man has a natural tendency to read himself into the creature under discussion. If a butterfly visits a flower of lovely colour, surely it must be appreciative of colour? That sort of thing. But as a matter of fact it need not be. Experimentation has shown that the possession of sense organs analogous to our own by an animal does not necessarily imply that the creature sees or hears, or whatever it may be, as we do. Plateau showed that certain insects continued their visits to brightly coloured flowers after the petals had been removed or concealed. Experiments of that nature led to a great reversal of opinion, and a school of thought sprang up that suggested that all backboneless animals were colour-blind. And that, as a matter of fact, can be disproved as easily.

What do we mean by colour-blind? In the first place it has a variable meaning for man, according to the number and nature of the colours that he can distinguish. Many people can distinguish only between red, green and violet; but that is not the only form of colour blindness. And then again, of course, one must discriminate between colour as colour and its brilliance as a reflector of light in general and ultra-violet rays in particular. When we think of colour, it is the colour of objects and not coloured light that comes to mind.

Daylight is the source of all colour, but we do not think of it as a colour at all. Probably we think of it as invisible, we certainly think of it as colourless. Yet it is this complex white light of day striking objects and being split up and reflected by them in a variety of ways that makes colour. A leaf is not green because it is green, but because it is full of a material that absorbs all the light-rays except the green and yellow ones which it reflects. Colours, in other words, result from the action of light on material objects. That, of course, does not mean that there is actually such a thing as red or blue or green. You cannot prove the reality of red or green or blue or any other colour by reasoning. All that we can say for certain is that our eyes and our minds working through our nervous systems give us the experience of colour.

A very slight difference in make-up (in the nervous system, that is) will result in what we term a colour-blind person, and it also results in animals, which are not so very different in structure (of the eye, etc.), being without a colour sense at all. (But in this connexion, I should like to point out that there is some evidence that our colour sense has changed a great deal within historic times. The ancient Greeks spoke of the human face as green : Homer speaks habitually of the sea 'wine-dark.')

Every group of animals has its own pattern of eyes, of course, just as it has its own pattern of life. And we must remember that the less like ourselves the animal is—and this also applies to its way of life—the less can we understand how it sees the world. Each animal must live in a world of its own to a very large degree. We must remember that the appearance of a thing exists only in our own minds : beauty lies in the eye of the beholder!

But we can tell a good deal by experiment and a good deal by deduction. Let us take the second first. So far as we can tell there are many animals that do not see colours (as we understand colours) at all. They live entirely in a black-and-white world. That is a perfectly possible and realistic world (the cinema has only recently taken to technicolour, and most photography is still black-and-white) and need not be in the least strange to us. Most four-footed mammals are thought to see their world in this way, as a world made up of blacks and whites and greys. Most of them are nocturnal or crepuscular. During these hours the world itself is a world of black and white and grey, a world of shadows.

So far as we can tell dogs and cats are quite unable to distinguish a colour from a tone of grey of the same brightness. There is no colour sense as such. (Bulls are not particularly sensitive to red. If they want to charge, they charge, red or not. They cannot distinguish red as red so far as experiment has shown, and a great many experiments have been made on this in Spain). The only mammals, other than man, that have a colour sense are the apes and the monkeys, and these are the only mammals that have bright colours such as reds and greens and blues. The colours of other mammals are blacks and whites and greys and browns, and the richest colours—e.g., the red squirrel—are chestnuts.

Birds, of course, can distinguish colours. They are themselves often brightly coloured, and that deduction would in any case be pretty safe. But there is also proof. Experiment has shown that birds distinguished red, orange, green and yellow colours clearly. They do not see blue very clearly (except the Lyre Bird of Australia) and they do not see violet at all. In this relation again it is interesting to note that violet is not found in the colouring of birds, and that blue is not common. Moreover, when it does occur—as in the macaws and the kingfishers—it is a very bright and metallic blue.

There can be no doubt that some fish can distinguish colours. It has been proved that the shanny can distinguish between a wide range of colours, and the same appears to be true of the minnow. There seems to be little doubt that the perch has also an acute colour sense, and anglers have claimed wonderful things for the trout! It may also be deduced that shrimps and prawns have a colour sense, and this would be true too for all those fish that have the ability to change their colour to suit the background against which they are resting.

But all these animals, excluding the prawns, have eyes very similar to our own. The eyes of bees and butterflies are very different from our own.

More experiments have been conducted on the colour sense of bees than on any other animal. Their importance as pollinators and as honey gatherers has resulted in the most intensive study of their habits—and the bee literature is perhaps the best, as it is certainly the most extensive, in this particular field. The visits of bees to flowers (bees, of course, are not the only pollinators) suggests strongly that they do see colours. But it must be remembered that some flowers at least do not attract bees by their colour but by their scent—holly, ivy, lime and willow for examples. But if you look at a list of the flowers most often visited by bees (*Plants and Beekeeping* by F. N. Howes, is the most complete that I know) you will find that a large number of them are blue or purple in colour. The fact is that bees do not see red as a colour. They are quite unable to distinguish red from black. This does not stop them visiting red flowers though, and they will even visit flowers that are pure red. We must remember that some flowers that appear red or pink to our eyes will not appear the same to the bee, but will look blue-pink. Foxgloves are a good example, for they have a blue component as you can see if you look at one through a green glass.

Indeed, bees may be said to live in a world of blue and yellow, a very, very different world from our own. They can see in ultra-violet light, and many white surfaces (white to our eyes) will not look white to them, for some will reflect or absorb ultra-violet light and so will appear blue-green to the bee, and thus will be most attractive.

Owls, of course, use part of the infra-red rays as light. (The green pigment of plants reflects a good deal of infra-red). This is something that is quite beyond the imagination of humans, since the infra-red is invisible to us, but if you consider the wonderful effect obtained by infra-red photography you will get close to realising the powers of the owl's eye. We talk about 'Seeing in the dark', but that is, of course, not what happens in the sense we mean. Mice are exceptionally warm-blooded animals and they emit infra-red rays and so are visible to the eyes of such birds as owls. Yet the eye of the owl is also sensitive to the violet end of the spectrum. This is so because there is much more violet light in the spectrum in the early hours of the morning. It is in these early hours that owls do most of their hunting.

Animals move about at the times when they can best see. If we had no artificial light we would have no night life. It is the age-old custom of peasants and of natives to get up at sunrise and go to bed at sunset. The human eye is a 'daylight' eye first and foremost. It can adjust itself to twilight (which is the daylight of crepuscular animals), but it never gets really good, not even with very long training, at seeing in the dark.

Ours is by no means the only world.

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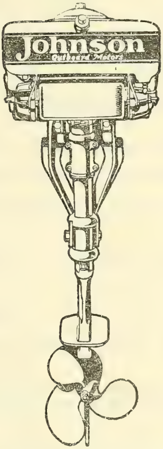

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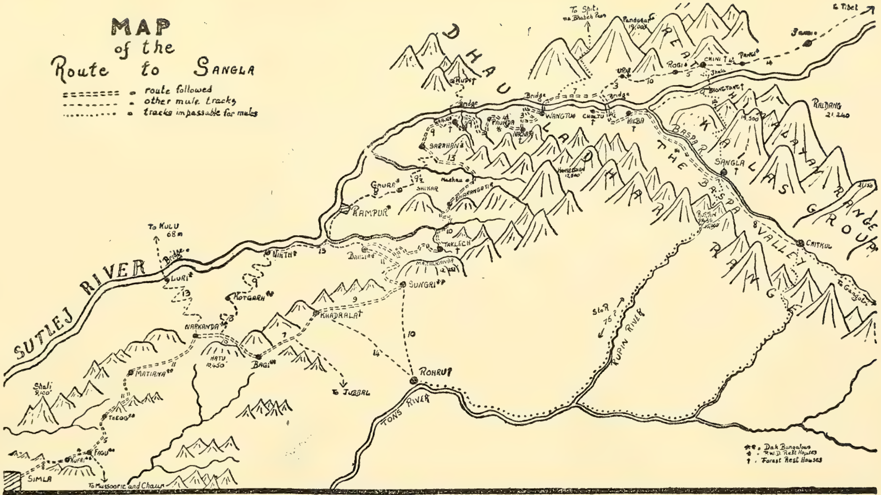

MAP of the Route to Sangla

========= route followed
- - - - - - other mule tracks
.... tracks impassable for mules
DHAULADHAR
THE BASPA VALLEY
KAILAS GROUP
RALDANG 21,240
SUTLEJ RIVER
TONS RIVER
RUPIN RIVER
BASPA R.
To Spiti via Bhabeh Pass
Pandusar 19,000
to Tibet
CHINI
ROGI
URNI
Jhula
BHONGTONG
Bridge
WANGTU
CHOLTU
KILBA
PAUNDA
NACHAR
SARAHAN
SANGLA
CHITKUL
To Gangotri
Rupin Pass 15,000
Hansbeshan 12,500
GAURA
SHIKAR
Nachar
DHARANGHATI
RAMPUR
TAKLECH
MARALKANDA 12,252
SUNGRI
BAHLI
NIRTH
LURI
To KULU 68m
KOTGARH
NARKANDA
HATU 10,450
BAGI
KHADRALA
ROHRU
To JUBBAL
MATIANA
THEOG
Shali 9,100
FAGU
KUFRI
SIMLA
To Mussoorie and Chaur
StoR 75
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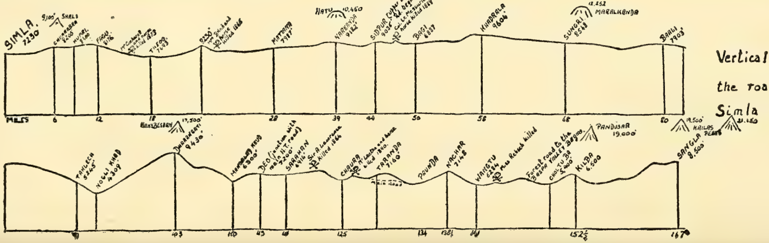
P.W.D. Rest Houses
Forest Rest Houses



Vertical Section of the road from Simla to Sangla

JOURNAL

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1948 VOL. 47 No. 4

AN EXPEDITION TO SANGLA IN KUNAWAR*

BY

M. A. WYNTER-BLYTH, M.A. (CANTAB.), F.R.E.S.

(*With a map and two plates*)

Ever since my first view of the Himalayan snows twelve years ago I had planned to make a trip into the inner hills. In particular I wanted to visit the Baspa Valley as it is well off the beaten track and I knew it was good butterfly country. Although I had made a number of shorter trips in the Simla Hills it was not until May 1947 that I eventually had an opportunity to carry out my ambition.

Except that the Baspa River joined the Sutlej somewhere near Chini I had only the vaguest idea of the valley's whereabouts, nor could I obtain the information I wanted in Simla. No maps were available, apart from a route map showing distances only (and these were inaccurate off the main Tibet road). I knew of no one who had been there and neither the P.W.D. nor the Forest Office could help me. Apparently nobody had visited the Baspa Valley for years.

Consequently I made all arrangements for a trip to Chini hoping to pick up information en route which would enable me to reach my first objective.

For the journey to Chini I had the cross section map that is reproduced in part here. It will be seen that this was a popular trip in days gone by and one that was fraught with considerable danger to both man and horse, though a more foolhardy means of transport over this road is difficult to imagine. Still, we were a hardier breed in those days, or can it have been that it was bad form to walk?

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* As it is difficult to get information about routes and conditions in the Simla Hills, I feel that this account of my journey to the Baspa Valley may prove of value to naturalists and others who wish to visit that attractive neighbourhood. M.A.W-B.

JAN 31 1949

I once read a graphic description in some mid-Victorian memoirs of a journey to 'Cheenee in Koonawur'. Such a trip was in the nature of a royal progress. The whole family travelled (and in Victorian times that in itself was often no small number), the women and children being carried in doolies and the men riding, followed by a veritable army of menials . . . cooks, bearers, syces, sweepers, bhistis, shikaris, and baggage coolies carrying all the paraphernalia of a complicated camp . . . the whole caravan numbering, one imagines well over one hundred souls.

My expedition could not compete with such as this. In fact it was almost as small as it possibly could be. There was myself, Sheba (my labrador and a *very* important person), two amiable mules and a pony, one muleteer and his chokra, and a servant.

To take the last first. His name (as far as I remember) was Koofy or something equally unsuitable. Although I was travelling as light as possible I felt that a servant was essential and this person was the only applicant. He was long and lanky, had drooping moustaches and was of a sour demeanour. He sagged ominously at the knees. Still, as he was undoubtedly a hillman I felt that he would at least be able to walk. He also said that he could cook. In actual fact he could do neither.

He went sick the first day out and for the next three days arrived at our halting place so late that he had no time to cook my meal. Thereafter I mounted him on the pony and by dint of arriving at the day's destination in the early afternoon he just had time to heat some tinned food and prepare chapatis and boil rice or potatoes ready for my supper. He could also make tea and porridge, and boil eggs. This was the sum of his accomplishments.

Even having reduced his exercise to these (to my mind) reasonable limits there were nasty moments when I expected him to leave me for a better land. I was much put to it to decide whether to deposit him somewhere en route on my outward journey and pick him (or his corpse) up on the return, or to carry him with me. In the end I left him at Kilba and picked him up three days later.

He only smiled once and that was when he rode into Narkanda at the end of the last stage of all . . . looking as usual very like Don Quixote . . . and asked me to find him another job. So I told him I knew a very important sahib in the Posts and Telegraphs who would doubtless be delighted to find him employment as a dak runner. Poor man! he hated every minute of our journey. We finally parted on the best of terms.

I subsequently learnt from the muleteer that I had been wasting my sympathy and that Don Quixote had really been quite well after the first three days. He was just slow and disagreeable by nature.

The muleteer was a very horsy, dapper little man who had the misfortune to have a cleft palate. Nevertheless in spite of this disability he was efficient, always helpful, and cheerful, even at the end of a twenty mile stage. His chokra, aged possibly twelve, knew all the answers and was likewise helpful and happy.

The pony was, I think, a retired children's pony. She showed no desire to come out of her retirement, and nothing could make her move faster than a slow walk. This held up progress considerably but suited Don Quixote. However, she was a pleasant creature and very fond of biscuits.

II

To Nachar by the Upper Link road

On May 21st I set out from Wildflower Hall for Narkanda by bus. Had Cherry Garrard ever undertaken this journey he would have changed the title of his book to 'The Second Worst Journey in the World'. I have driven across the Andes in a lorry . . . a journey that involved a climb of four thousand feet to a sixteen thousand foot pass, a drop of twelve thousand feet and a final climb of two thousand five hundred feet, all in the space of sixty miles on a road of the most terrifying nature, but for sheer terror that journey was as nothing compared with the trip to Narkanda in a ramshackle bus driven by a maniac driver.

Still we got there. All was ready when I arrived and we completed the ten miles to Bagi through the lovely Bagi forests long before nightfall.

These forests, which are mainly composed of Spruce (*Picea morinda*) and Narkanda Pine (*Abies pindrow*) with a liberal admixture of oaks, planes, horse-chestnuts and walnut trees, are a fine place for butterflies (especially *Lethe*) and birds. I am afraid my comments on the bird life of the country I passed through on this trip are almost negligible. This does not mean that I was disinterested but is due to the fact I am unable to concentrate successfully on two branches of natural history at the same time.

There is a second route to Bagi over the top of Mount Hatu (10,450′) which is even more attractive than the lower road through the forest and, if somewhat more exhausting, is about one mile shorter. The summit gives a fine view over the country to be passed through during the next few days and is also the home of many kinds of butterfly . . . in particular the very local Comma (*Vanessa egea*), the beautiful Blue Peacock (*Papilio arcturus*), the Common Yellow Swallowtail (*P. machaon*), the Common Blue Apollo (*Parnassius hardwickei*) and other species that haunt hilltops.

Why do so many butterflies love the tops of hills? Surely such cold and draughty spots should be particularly unsuitable for these fragile creatures? But such is not the case, and in the Himalayas hilltops rank second only to sunny forest nullahs as happy hunting grounds for the collector.

To my mind Bagi in its quiet unobtrusive way is one of the most beautiful places in these hills. Here are no broad vistas or stupendous views of snowy peaks but pleasing forest glades and wooded hillsides. The village and the bungalow are set in a clearing and all around are trees. The bungalow is small and clean and in front is a lawn kept close cropped by the tiny hill cattle.

Good food too is provided here (and also at Narkanda), but from now on the traveller must rely almost entirely on provisions carried with him. In some places it is possible to buy eggs, fruit (if it is the season), potatoes, chickens and atta but such supplies are chancy and uncertain.

At Bagi the water was brown and cloudy so I doctored it with some vivid yellow pills I had brought for the purpose. The result was unfortunate for it made the water taste nasty as well as upsetting me so violently that I was extremely unwell for the next two days. After this my rule was to drink freely of spring water, and from any clear streams running down the hillsides unless they had obviously passed near a village. At the rest houses I always had the water boiled. This seemed a satisfactory plan . . . at least I suffered no ill effects.

It is supposed to be a bad thing to drink much water when on the march. Why I do not know. I always drink a lot when walking and find frequent draughts of water most invigorating.

The stage from Bagi to Sungri though long is not tiring. There are no steep hills and the way, lying as it does between 8,500′ and 9,600′, is cool. After the first four miles, at which point the road to Jubbal turns off on to the fine ridge known as Ganasi Dhar (a good place for the beautiful little Blue Sapphire butterfly, *Heliophorus oda*, in early June), most of the way gives extensive views over the valleys of the Tons river and its tributaries. At 7 miles lies Khadrala (9,600′ and the highest point on the whole trip) near which place I met Bazalgette, the Political Agent for the Simla Hill States, returning from Rampur, where he had been installing the council of regency. From him I got valuable information about the route to the Baspa Valley, and from now on this was my objective.

I have an acquaintance who once had a dog taken by a panther close to Khadrala at 10.00 in the morning. As the same man also lost a dog at 3.00 in the afternoon in Kulu it would seem that it is quite wrong to suppose a dog safe from attack between dawn and dusk as one is so often told. I kept my dog on the lead almost the whole of the trip, not because she is likely to wander, for she has a keen eye to her own security and does not like me far out of her sight, but because monkeys prove an irresistible attraction to her. Furthermore, if the wind is favourable she can scent them at a distance of several hundred yards and is then off like the wind. This is not a good thing in panther infested country. It was not until I reached Nachar that the monkey menace ceased but panthers are bad all along the road as far into the hills as the Baspa Valley itself. The shepherds whom I met beyond Sarahan driving their sheep and goats up the Tibet road all keep one or two dogs to guard their flocks. These dogs, which are all much of a type, are large creatures with fine heads and bushy curling tails. In colour they are usually black with tan markings and in spite of their fierce appearance are singularly docile animals. To protect them against the attacks of leopards, which always seize their prey by the throat, they wear around their necks broad iron plates with their edges deeply toothed and upturned. These will protect the dog, at least till the owner has time to come up and drive the beast away. The hill people have little fear of the leopard and there are many tales of men pulling sheep and goats away from them. Later on I met one of these shepherds whose dog had been attacked by a leopard the previous night. This dog, though a very sick dog with a torn throat, was far from dead, but as the shepherd was on the move up the road I fear that it cannot have survived long.

And so on to the squalid bungalow at Sungri with its dirty village and swarms of flies. Here in an exhausted state I waited a miserable two hours for my transport to turn up, followed considerably later by Don Quixote in such a state of collapse that I had to cook my own food.

Hereafter I always took the essentials for a midday meal with me. To avoid the heat of the day I started soon after sun up with the inevitable result that I reached my destination far ahead of my transport.

It was nine years since I had visited Sungri but little had changed in that time. The bungalow was perhaps a shade more dirty, it was certainly more dilapidated, but there were still the same difficulties of obtaining water and firewood, and the staff was just as slovenly. In short it is perhaps the least attractive place on the whole of this route.

Sungri is situated on the southern slopes of Maralkanda (12,250′), a fine hill, and itself an outlier of that magnificent mountain Hansbeshan. I had made the ascent of Maralkanda in the past. It is an easy though long climb and is well worth doing if only for the magnificent view from the top. My main memory of that ascent is that our guide (a hillman who climbed so rapidly that we felt that the laws of gravity must have been relaxed in his case), armed with a very nasty looking axe, went well ahead of us through the forest and every now and then signed to us to stop as he went ahead to prospect round some blind corner. Though the hill folk think little of leopards they have a very healthy respect for the Himalayan black bear which is common round here.

The route goes straight up the forested spur by the side of Sungri and at about 10,500′ turns left along a ridge and thence up to the grassy summit of the mountain. No trees grow above about 11,000′. The summit is peopled with Himalayan Pikas (*Lagomys roylei*), guinea pig-like little creatures that have their homes among the scattered stones and rocks. It was amusing to see them poking out their heads to look at us and scuttling about when they thought they were not observed. I remember, too, that there were many Red-billed Choughs living among the crags below the summit, and at 12,000′ I saw a Small Grass Yellow (*Eurema brigitta*). This is, of course, a common plains butterfly and its discovery at this altitude must give it a climatic range greater than that of any other Indian species except the Painted Lady (*Vanessa cardui*), which may be found everywhere up to 15,000′ (and probably much higher). Lower down I caught a female of the Large Green Underwing (*Polyommatus galathea*), the nearest point to Simla at which this lovely little butterfly has been found.

However, this was nine years ago and I had no time to repeat the ascent.

It is an easy, pleasing walk to Bahli. First there is a fairly steep descent through forest for five or six miles followed by a very gentle climb for the remaining five along the sunny side of the long ridge running from Maralkanda to the Sutlej. The forest is a fine hunting ground for Treebrowns (*Lethe*), the Common Forester (*L. insana*) in particular being quite an abundant species, and in one of the nullahs I saw the Himalayan Jester (*Symbrenthia hypselis*) sailing about in the chequered sunshine. Although I had sought in vain for this butterfly during the five years I collected in the Simla Hills it was not the last time I saw it on this trip. Indeed it proved to be quite common about forest streams between this spot and Sarahan, though it was too late to catch good specimens as I fancy they had emerged from their chrysalids some two or three weeks earlier. In flight and habits it is very like a yellow *Neptis* and indeed, when I first saw it, I mistook it for *Neptis ananta*, that great rarity in these hills. Here also was *Heliophorous androcles* which is like a flash of green light on the wing.

The last six miles lie through pleasant fields of wheat, potatoes and poppies, and the roadside is made beautiful by masses of white roses and a purple broom-like plant (*Indigofera gerardiana*?).

Bahli, with its attractive whitewashed bungalow, lies on the top of the ridge with the land sloping down very steeply both to the north and the south. On the other two sides is forest of Blue Pine. Visibility was very poor and there was no view except of the dim outline of the large rounded peak of Shikar over the valley to the north and a glimpse of the Sutlej distant a mile or two down to the left.

Towards evening the sky darkened and a violent storm broke upon us. For half an hour there was torrential rain and incessant thunder. Then the sun broke through again and within a very short time the clouds had cleared away leaving the air cool and crystal clear to reveal a magnificent panorama of the mountains, from the Kulu Hills on the left, to the Great Himalayan Range straight ahead and Hansbeshan close to the right. It is the most extensive view to be had on this journey and one of the loveliest I have ever seen.

Night fell and the singularly attractive night noises of the middle Himalayas began to make themselves heard . . . the *pink-pink* of the Himalayan Scops Owl (exactly the sound of a smith beating iron on his anvil), the moan of the flying squirrel, the sneezing bark of the hill fox and the innumerable other sounds most of whose owners I have never been able to trace.

But if the noises of the night are attractive it is of the day sounds that I have the most pleasant memories . . . the shrill wail of the Himalayan Barbet from a treetop, the curious calls of the various cuckoos, the grating and ubiquitous cry of the nutcracker, the melodious songs of the rockthrushes, the tuneless whistle of the

Kastura[1] and the ever present background of twitterings and tiny noises of titmice, tree creepers and other such small fry.

The stage from Bahli to Taklech is another easy one . . . 11 miles and all downhill. The first five miles are through the forest along the northern side of the ridge that was traversed the day before.

One of the most characteristic features of the Simla Hills is that the southern sunny slopes are bare whilst the northern slopes are more often than not completely forested. Consequently from a southern aspect many of the hills appear as grassy slopes curiously topped with a fringe of trees.

From Bahli to Deo, near Sarahan, where the main trade route is joined, the road is very lonely and I have often wondered for what purpose it was built because it is used hardly at all. All the trade between Tibet and India takes the direct and shorter road along by the Sutlej and up to Narkanda. This upper road is only of use for local traffic, which would be served just as well by the ordinary hill track, and for such as myself who wish for a cool journey in the summer, for the bed of the Sutlej between Narkanda and Sarahan lies at about 3,000′ and is terribly hot at this time of the year. This, I think, is the solution of the problem. I suspect that in days gone by some Viceroy or Governor-General wished to visit Chini and, wanting a cool journey, gave the order for the road to be built.

Shortly after leaving Bahli I made a great catch . . . *Celaenorrhinus munda* (or more simply the Himalayan Spotted Flat), a singularly dull-looking Skipper of whose existence in the Simla Hills I had grave doubts. Subsequently I caught three more and saw others between Bahli and Sungri so that it seems that this insect is not uncommon here.

After five miles the road descends abruptly, first through oak forest and then through a rich growth of deciduous trees with a thick bamboo underwood. Lower down this gives way at 6,000′ to an open forest of *Pinus longifolia*.

Half way down the hill begins a very prolific butterfly area. This was heralded by the appearance of a solitary specimen of the pretty little blue and white Water Hairstreak (*Euaspa milionia*), a rarity in these hills. Lower down I saw one or two more and presently, where the road crosses over a well-shaded stream, I came upon their home. Here they were in their dozens, resting on mossy banks, on ferns and on the leaves of trees and bushes. They are sluggish little creatures and shun the sunlight; if they are disturbed they flutter about slowly but soon come to rest again. So averse are they to flight that it is almost possible to catch them in the fingers.

With them, but in smaller numbers, was the little purple Walnut Blue (*Chaetoprocta odata*), an equally lazy creature and also a lover of the shade, though this butterfly flies about in the open rather more briskly towards evening. It was more common lower down by the stream just above the Taklech bungalow. Indeed on my return it was to be found there in its thousands, being more common than I would have believed any butterfly could be. Both here and at many other places along the road the walnut trees had been half stripped of their foliage by the larvae of this butterfly. This did not seem to have harmed the trees as they were healthy enough. Doubtless they are stimulated to put out a second growth of leaves and little damage results.

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[1] The Himalayan Whistling Thrush.

From the large numbers that were about it seems probable that the Walnut Blue is very favourably placed in the struggle for existence. This may be due to the domestic arrangements of the female who lays her eggs in batches and thatches them with a protective layer of scales, a proceeding unknown in any other Indian butterfly. These scales may be seen at the end of her abdomen grouped together in a bunch that looks very like the business end of a tiny shaving brush. As each egg is laid several of the scales attach themselves to it fanwise, covering most of the egg itself and the exposed part of the next egg laid, and so on. The batches are so arranged that all the eggs are covered except for a small portion of the last egg laid, and the whole mass, except for the last egg, is thus admirably protected from the minute parasites and other insect enemies that prey on butterflies' eggs.

Close to the bridge near the Taklech bungalow many kinds of butterflies may be caught, and there, in particular, I took the Marbled Flat (*Achalarus bifasciatus casyapa*), the Veined Scrub Hopper (*Aeromachus stigmata*) and the Dark Evening Brown (*Melanitis phedima galkissa*), as well as numbers of the more attractive local species such as the Map Butterfly (*Cyrestis thyodamas*), the Spangle (*Papilio protenor*) and the Glassy Bluebottle (*Zetides cloanthus*), which, with many others, were drinking greedily from a small moist patch of ground. Further up the hill I caught the Common Five-ring (*Ypthima baldus baldus*), an abundant butterfly in many parts of India but a rarity in the Simla Hills. This specimen was remarkable in that it was a fully marked wet season form.

Taklech lies in a narrow valley, thickly wooded on the protected side, down which a little river runs steeply to join the Nogli Khud some 800′ lower and a mile away. Its waters ran crystal clear until the late afternoon when they became cloudy, due, I believe, to the melting of snow high up near their source.

The inhabitants here are some of the poorest that I have ever seen and are clad in the meanest rags. It must be a very hard task to wrest a livelihood from these steep hillsides, but nevertheless, like most hill people, they seemed contented and cheerful.

Taklech, and the hillside before Dharangati, is a home of the 'jaldi aru', the tree that provides the little round apricots that ripen early. They were not yet ready but I made of them an admirable addition to my diet by boiling them with honey. They were ripe on my return and as the tree is very common I could have as many as I wished, but after all they are a somewhat tasteless fruit and a poor substitute for the true apricot.

That evening, just as it was becoming dusk, a Spinetail swooped down towards the bungalow and was gone in a flash. These are the fastest of all birds and with their robust bodies and pointed wings, shorter than in other swifts, are easily recognised and curiously resemble some of the more modern fighter planes.

Two and a half miles away from Taklech and at a height of only 4,309′, the lowest point reached on the expedition, the road crosses the Nogli Khud, a turbulent little river that here runs through a considerable gorge. The Upper Link Road, however, soon atones for this fall from grace by climbing 5,121′ in the next seven miles to attain an altitude of 9,430′ at Dharangati.

For five tedious, tiring, interminable miles the track twists up a shadeless hillside towards a ridge that looks deceptively like the end of the climb, but when I reached it I was horrified to see that Dharangati was a further two miles away at the top of a sort of pass over another and higher ridge.

Half way up the hillside (which is locally famed for its Chukor, though I only saw one covey) I came across an encampment of gujars with their herds of horses and buffaloes grazing round about. Though tall, dark and handsome, they are a wild-looking race of nomadic Muslims from towards the Kashmir border. They drive their animals down to the plains at the foot of the hills in the winter and return to these summer pastures in the spring.

The view from Dharangati compensates for the endless climb. Dharangati looks across the deep valley of Mangalad Khud to Hansbeshan (17,500′), a magnificent mountain whose sharp peak rises above precipices. As it is usual to liken such mountains to the Matterhorn I shall perhaps be original when I say that Hansbeshan bears no resemblance to it at all but is nevertheless the finest peak in this part of the Himalayas. To the right is a long ridge, which runs in a wooded semi-circle to join a spur of the great mountain itself, and to the left is a fine view of snow-capped peaks. Around the bungalow is forest, the home of Monal, Koklas and Kalij pheasants, all of which may be seen close by.

It proved a disappointing place for butterflies as I had hoped to catch the Green Copper (*Lycaena kasyapa*) and the Large Green Underwing here, but all that there was about were the species usually found at this altitude nearer Simla . . . the Large Silverstripe (*Argynnis childreni*), the Common Silverstripe (*A. kamala*), the ubiquitous Queen of Spain Fritillary (*A. lathonia*), Indian Tortoiseshell (*Vanessa cashmiriensis*) and Dark Clouded Yellow (*Colias croceus*), as well as an occasional Pale Clouded Yellow (*C. hyale*), Common Yellow Swallowtail and Common Blue Apollo.

On our arrival there was no rest-house keeper to be found, so we sat ourselves down on the hard boards of the verandah and shivered, for there was a cold wind blowing. After half an hour the chowkidar turned up, opened the place and boiled me some water. As I sat in peace, drinking coffee and admiring the view, the belated arrival of Don Quixote inspired me to poetry. The limerick that I composed pleased me immensely at the time, though subsequently I have had doubts as to its perfection. Here it is:—'I took an old cook to Bashahr[1] where he found out that life was unfahr, for although he was sickly, he was made to walk quickly, until he was put on a mahr.'

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[1] Pronounced to rhyme with 'stair'.

This day the transport turned up even later than Don Quixote, having had trouble with the second mule, the less placid of the two, which had hurled one of my boxes of supplies far down a khudside. The only damage was to a packet of Lux which had burst all over the other contents of the box with the result that henceforward much of my food was flavoured with soap.

Mules, by the way, in my experience, are much maligned animals and not the vicious creatures that they are supposed to be. I have always found them fairly amiable and very long suffering. Perhaps once in a trip they will throw the baggage down the hillside and they must be carefully watched at the end of a day's stage to see that they lie down to have the roll they so much love to have *after* their loads have been removed. On the whole they are very reliable and will, if pressed, willingly do their 30 miles.

The rest of the afternoon was not peaceful. Sheba discovered a remarkable triple echo and spent two happy hours barking at three imaginary dogs which invariably hurled back her abuse word for word from the forest over the way.

Don Quixote distinguished himself by breaking the only bungalow teapot. As he had already broken a lamp at Bahli and a water jug at Taklech I began to have fears that I should not stand the pace financially. However, this was his last lapse and he broke nothing more.

It is an easy descent of 3,000′ through forest to the bridge over the Mangalad Khud. After crossing it the track runs across precipices and steep sunny slopes to join the main Hindustan-Tibet road at Deo. It was a hot and thirsty walk.

Sarahan is in two parts. Below the road is old Sarahan, a typical hill village: above the road is Durbar Sarahan, the summer capital of Bashahr State. The bungalow is situated between the two.

The Sutlej Valley is wide here and gives a fine view of snowy peaks.

Just after leaving Sarahan I overtook the first of many flocks of sheep and goats being driven up the road to Tibet. Most of the animals were carrying little packs containing salt or grain and the herds were always escorted by one or two big dogs wearing the iron collars mentioned earlier on. Their return journey is made in the autumn when borax and wool are brought down to the markets in India. Whether, like the Marchas of the Kumaon, these shepherds have villages high up on the Tibetan border which they inhabit during the brief summer I do not know, nor did I enquire, as at that time I had never heard of the Marchas.

Having left the Upper Link Road I was now on the main trade route to Tibet and there was plenty of traffic passing up it, for the Shipki Pass usually opens at the beginning of June. As well as the flocks of sheep and goats there were strings of donkeys and pack ponies and numerous foot passengers.

Beyond Sarahan the road enters the Sutlej Gorge and runs fairly level at about 3,000′ above the river bed. The scenery is impressive but the valley is so narrow and the sides are so high that views of the snowy peaks are limited and remain so until Sangla is reached.

I saw few butterflies. The Himalayan Sailer (*Neptis mahendra*) was very common and I caught a number of Common Argus (*Erebia nirmala nirmala*) in the hopes of catching the race *scandina* which has the under hindwing overlaid with pale grey scales, and is listed from Bashahr and Kunawar. I did not see it and I imagine it is a dry zone form. The only other butterflies I remember catching were the Marbled Flat, the Lepcha Bushbrown (*Mycalesis lepcha lepcha*), the Common Forester and the Green Sapphire, as well as a most interesting form of the Indian White Admiral (*Limenitis trivena*). This species is remarkable because it displays racial variation more clearly than any other Indian butterfly. Indeed if the two extreme races are seen without the intermediate forms they can hardly be recognised as the same species. The races mainly differ in the width of the white band that crosses both wings, this being very broad (7 mm.) and confluent on the hindwing in the Simla form (*pallida*), but very narrow (2 mm.) and broken into separate spots in that from Chitral (*gilgitica*). Of the intermediate races *hydaspes* (from the Sind and Liddar Valleys, Kashmir) grades into *gilgitica*, the discal band being broader (3 mm.); *ligyes* (Pir Panjal, Kashmir), with the discal band broader still, grades into *hydaspes*, but as *trivena* (Murree to Kangra) is almost the same as *pallida* (and in particular has the white band of the same width), there is a very considerable difference between this form and *ligyes*.

Evans only gives the distribution of the races as mentioned above, but as I already possessed *hydaspes* from Chini, I assumed that I should find the same sequence of races in a northerly direction. As I expected, I caught *ligyes* in the Baspa Valley, and very likely *gilgitica* is to be found round about Jangi, but *trivena* was not to be seen anywhere. However, the specimen I caught close to Chaura is perfectly intermediate between *ligyes* and *pallida* and in all probability replaces the *trivena* race in the Simla Hills, but although palaeontologists may reconstruct an extinct species from the fraction of a fossil skull, and tell us all about the habits of the creature it belonged to, such latitude is not allowed to the entomologist, and, because I only caught this one specimen (which possibly may have been an aberration), I am, quite rightly, not allowed to assume that it is a typical example of a new local race.

The bungalow at Chaura, although, like all these forest rest houses, situated in a place of great natural beauty, is rendered almost uninhabitable by the swarms of flies that infest it. With the notable exceptions of Narkanda, Bagi and Sangla, all the bungalows along my route were swarming with flies, and they are the one great drawback to this trip. But of all of them Chaura is the worst. The flies settle in countless hundreds on food, on tables, on the shiny leather backs of chairs, on the floor and on one's face, making life almost unbearable. The repeated use of Flit inside the rooms undoubtedly keeps the numbers down but as there are invariably tears in the fly-proof netting on doors and windows it does not stop a constant influx of new arrivals, nor is it of any use on the verandah. A large supply of netting or muslin covers could be used to protect food and drink . . . but this would mean removing and replacing the covers between each mouthful. I decided that the problem was insoluble and did nothing about it. The addition of flies to my diet did me no harm, but it is a wise man who takes with him a cure for dysentery.

But these flies, which were house flies or their near relatives, are not the only members of the order sent to torment the traveller. There are also the large brown horse-flies (*Tabanus* sp.) which are common everywhere between Wildflower Hall and Dharangati (beyond which place they cease to be a trouble). These inflict very painful bites and tear chunks of flesh (or so it seems) out of one's knees and ankles, but as they fly with a loud buzzing noise, they give warning of their approach and so may be avoided, especially if long trousers and not shorts are worn.

In addition Chaura is a bad place for panthers and a reference to the bungalow register will show that owners of dogs should beware.

Finally there are good apricots to be had here and having at last found something good to say about the place let us hasten to leave it.

Four miles from Chaura there is a fine view down the Sutlej Gorge and from there for a couple of miles the road is bad and crosses some uncomfortable precipices which are especially unpleasant as the road has no parapet. After this there is a steady descent to Soldanga Nullah with its squalid serai, close to which is the first sign of Tibetan influence, a prayer wall. These are long structures built down the middle of a road, especially at a pass or at some point of importance. The stones on the top of the wall, and often at its sides, are inscribed with Tibetan characters representing 'Om mani padme hum (I am in the pericarp of the Lotus[1])', the prayer that the lama mutters as he turns his prayer wheel. The correct procedure is always to pass them on the left-hand side. Although, working on the principle of when in Rome do as Rome does, I conscientiously observed this rule, truth compels me to relate that the local inhabitants do not.

That the Tibetan influence was once strong in these parts may be seen from the number of prayer walls further on and also from the style of some of the buildings, especially the temple a mile and a half beyond Paunda and the monastery at Nachar.

After a long two miles climb Paunda was reached at the end of a most exhausting day's walk. The transport was miles behind and did not arrive until dusk, as it had been badly held up by the flocks of sheep and goats, and it had been a hard task to manage the mules over some of the difficult stretches of road.

However, their late arrival did not matter as the bungalow was already occupied by Dr. Crookshank, Geological Adviser to the States, who fed and entertained me.

Before I left the next morning the chowkidar tried to sell me the skin of a Red Flying Squirrel (*Pteromys albiventer*). It is a shame to kill these pretty little creatures for although their fur is soft and fine the pelts are too fragile to be of any use.

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[1] More usually, but loosely, translated 'Hail to Thee, Jewel of the Lotus.'

I wonder how many people know that flying squirrels make the most engaging pets. They are very easily tamed, although wild and frightened when first caught. I knew one that was quite at home within twenty-four hours. For the first day or two it was kept shut in the house, given a dark cage in which to spend the daytime, and fruit and nuts to eat. When it had grown quite accustomed to its new quarters it was not confined at all and was allowed to leave the house at dusk, returning to its cage at dawn. This mode of life continued for some time, but after a while it would every now and then be absent during the day as well, and ultimately it stayed away altogether, though it was seen near the house on more than one occasion.

It was quite tame and did not mind being handled, even by strangers. When picked up in the daytime it would crawl up the person's sleeve to lodge between the coat and shoulder, presumably an ideally warm, dark place.

In a wild state they spend the daytime in a hollow in a tree, or in some similar place, and only come out at dusk to look for their food. Their method of progression is interesting. Having come out from their hiding place, they climb high up the tree and then hurl themselves into space to glide down towards the trunk of another tree, which may be as much as 80 yards away if the flight is down a steep hillside. Just before reaching it they suddenly flatten out to land on all four feet. They then climb that tree and the process is repeated until they reach their destination. Up hill, of course, their progress is laborious.

As the transport was still tired from the previous day's exertions I decided to have an easy day on the 28th and to make for Nachar, only 4½ miles up the road.

It was a pleasant early morning's walk and by ten o'clock I was sitting on the verandah of the Nachar forest bungalow eating luscious white cherries from the garden. The bungalow is an attractive two-storied building and struck me as being palatial . . . subsequently I was surprised to learn that it had been condemned as unsafe some years ago!

The garden is a delightful spot with a hawthorn bush and apple and cherry trees. All sorts of vegetables were growing but unfortunately none were yet ready.

III

The Dry Zone

As the S. W. monsoon proceeds up the Sutlej Valley its influence decreases so that it is possible to divide the adjacent regions into three climatic zones;—a wet zone which extends to Paunda, a dry zone (where the influence of the monsoon is slight) which begins there and extends to within 30 miles of the Tibetan frontier, and an arid zone (where the monsoon disappears) beyond that.

Annual rainfall figures are about 60″ at Simla, 44″ at Kotgarh and 32″ at Kilba, but in the dry zone much of the precipitation takes place in winter in the form of snow[1].

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[1] Precipitation figures for Kilba are as follows:—June to September 10.5″. October to May 21.5″.

As a consequence of this change of climate the vegetation and butterfly fauna of the dry zone is very different from that of the wetter regions nearer Simla. The rich forests of Spruce and Narkanda Pine are now replaced by Cedars (Deodars), and lower down the characteristic tree is the Chilka Pine, of which more anon.

In particular there were two dry zone butterflies that I was anxious to catch which I knew could be found at Nachar . . . the Branded Meadow Brown (*Maniola lupinus cheena*) and the dark form of the Green-veined White (*Pieris napi montana*). But I was unlucky and did not see them. Of course it was as I had feared. I was much too early for butterflies in the dry zone where they are only abundant during the short summer from the end of June until mid-August.

There is thick cedar forest round the bungalow and a pretty view over the treetops to the mountains on the other side of the valley. Close by is the local school, doubtless an admirably conducted institution but apparently run on non-repression lines; a little beyond is a picturesque building which I took to be a monastery, for it bore a clerical air and, unlike the school, was wrapped in monastic calm.

Nachar is the forest headquarters of the Upper Bashahr division and the D.F.O. is stationed here during the summer months: in the winter when snow closes the road he moves down to Phillaur on the plains. I doubt if any government official is stationed in a more remote spot than this.

The forests are leased from Bashahr State and the main business of the department is the extraction of cedar timber. Except near the Sutlej this has to be manhandled as it is a difficult country for forestry, but down the sides of the gorge there are wire ropeways to transport the wood to the river bank, where it is stacked and cast into the water when it is near its highest flood. A month or two later it reaches the plains and is collected at (I think) Bilaspur. The losses amount to 10%.

In addition to its other amenities Nachar possesses a sub-post office and a dispensary.

The building did not collapse during the night and shortly after dawn we set off into the great unknown. Being by this time in good training I trotted down the steep road to Wangtu . . . much to the astonishment of Sheba, who is unaccustomed to such levity on my part. However, there was method in my madness as I rightly suspected that the 5 or 6 miles along the Sutlej gorge would be unpleasantly hot later in the day. It must be admitted that I did not trot up this stretch on my return journey for a more unpleasant climb during the middle of the day it has not been my lot to experience. The hillside radiates the heat like the outside of a furnace, the road is steep, so steep that most of it is stepped, the steps being placed just so far apart that it is impossible to climb with any rhythm, the surface is loose and rough and I was tired at the end of a long walk. How I should have loved a quart of beer when I arrived at the top. All I had was Nescafé and that was as nectar!

If I were to write a murder story without any doubt at all I should make its setting the Wangtu bungalow, for a more forbidding spot I have never seen. It stands stark and lonely on the bare craggy hillside above the Wangtu bridge, where the Sutlej rushes with incredible fury through the gorge, penned into a width of a mere 25 yards between the cliffs. I made no stop here but hurried past.

The Sutlej is a frightening river. Its fury and power must be seen to be believed. Looking down upon it from near Taranda I had wondered how it had cut this terrific gorge straight across the Himalayan ranges. On seeing the river at close quarters it was no longer hard to understand.

The road runs along the gorge and for seven miles keeps close to the Sutlej except for one stretch where it climbs steeply over a bluff. The scenery is bare and grim and the noise of the river is deafening. At the seventh mile the track turns left up the hill to Urni and almost immediately the forest road to Kilba branches off to the right, descends for a mile and, after crossing the river, begins the stiff ascent of four miles to Kilba.

The main Tibet road continues on, ultimately to reach Gartok. Shipki, the first village in Tibet, is 82 miles away and, after Urni, which is four miles from the junction with the Kilba road, the stages are as follows:—

Urni to Rogi 10 miles,
Rogi to Chini 4 miles,
Chini to Pangi 4½ miles,
Pangi to Jangi 14 miles,
Jangi to Kanam 11½ miles,
Kanam to Poo 16 miles,
Poo to Namgia 8 miles,
Namgia to Shipki 9½ miles.

There are rest houses at all these places except Shipki, which, of course, is over the border in Tibet. There is no particular difficulty about the journey except that the traveller must have a good head for heights as the road cuts across very high cliffs in several places. The Shipki Pass, which lies between Namgia and Shipki, is more that 15,000′ and is normally open in early June. Whether any serious attempt is made to stop the European traveller from crossing the border I doubt, but I do know that he is supposed to get permission to do so.

An interesting point about this road is that by the time Pangi has been reached the traveller has passed right through the main Himalayan range, this being the only easy way by which this is possible.

For some years Mr. Alec Jones and myself employed a trader, who plied between Gartok and Simla, to catch butterflies for us along this route. Good butterflies are to be caught at Chini but we received little of interest between that place and the Shipki Pass, the country probably being too barren and dry for them. But the northern slopes of the pass and the country around Shipki itself abound in butterflies during July, as may be seen from the list that follows of the more interesting species we received from there.

Papilionids: the short tailed form of *Papilio machaon* (*ladakensis*), *Parnassius simo*, *P. charltonius*, *P. stoliczanus spitiensis*, *P. epaphus nirius*(C)[1] *and P. jacquemontii jacquemontii*.

Pierids—*Baltia butleri butleri*, *Pontia daplidice moorei* (C), *Pieris callidice kalora*, *Colias eogene eogene*. *C. ladakensis* (C), and also *Pontia chloridice* from Puri close by.

Satyrids—*Maniola davendra davendra* (C), *M. pulchella* (C), *Aulocera brahminus brahminus* (C), *Erebia kalinda kalinda* (C) and *Eumenis mnizechii baldiva* (C).

Nymphalids—*Argynnis eugenia mackinnoni*, *A. adippe jainadeva* (C), *A. pales sipora*, *Melitaea arcesis sindura* (C), *Vanessa ladakensis* and *V. urticae*.

Lycaenids—*Polyommatus metallica metallica*, *P. pheretes lehana*, *P. eros ariana* (C), and *P. vicrama vicrama* from Puri.

Skippers—*Hesperia alpina alpina* and *Pamphila comma indicofusca*.

From the Shirang La (18,000′), ten miles beyond Shipki, we also obtained a long series of a hitherto undescribed race of *Parnassius stoliczkanus*, the characteristic features of which are given in the Appendix at the end of this article. From Gartok (ninety miles further on as the crow flies) we have also received *Polyommatus gigantea* and *Pieris deota*.

There were few butterflies between Wangtu and Kilba and such as there were were those that are common at this height in the foothills. The Pioneer (*Anaphaeis aurota*) and the Common Gull (*Cepora nerissa*) were abundant, the Yellow Orange-tip (*Ixias pyrene*) and the Hybrid Argus (*Erebia hybrida*) were common, and an occasional Common Peacock (*Papilio polyctor*) supplied a much needed dash of colour to the scene. A few tiny Grass Blues (*Zizeeria*) fluttered about, and once or twice I saw a White-edged Rockbrown (*Eumeris parisatis*) dash rapidly past. This handsome butterfly, which has always been a favourite of mine, flies faster than any other Satyrid that I know of. It is very much a lover of open and rocky places and is particularly difficult to catch as it is both very shy and has the exasperating habit of settling in inaccessible spots. To my mind it is one of the finest of the Browns, only surpassed in the Simla Hills by the Great Satyr (*Aulocera padma*) whose sober dress of velvet-black and white and graceful flight can be matched by very few Indian butterflies.

A little beyond the Choltu bridge the road climbs steeply to Kilba. Here for the first time I saw the Chilghoza Pine (*Pinus Gerardiana*), the tree that produces the oily edible nuts[2] known as chilghosas. The tree looks very like the Blue Pine (*Pinus excelsa*) of Simla but the bark is smooth and the needles are in clusters of three. The wood is soft and only of use as firewood, but is admirable for this purpose as it is very oily.

The rest house at Kilba is about 800′ above the river and some 300′ above the village which is the range headquarters and like Nachar has a dispensary and a sub-post office. Urni is to the left across the valley and behind it is the high snow peak of

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[1] (C) = Common

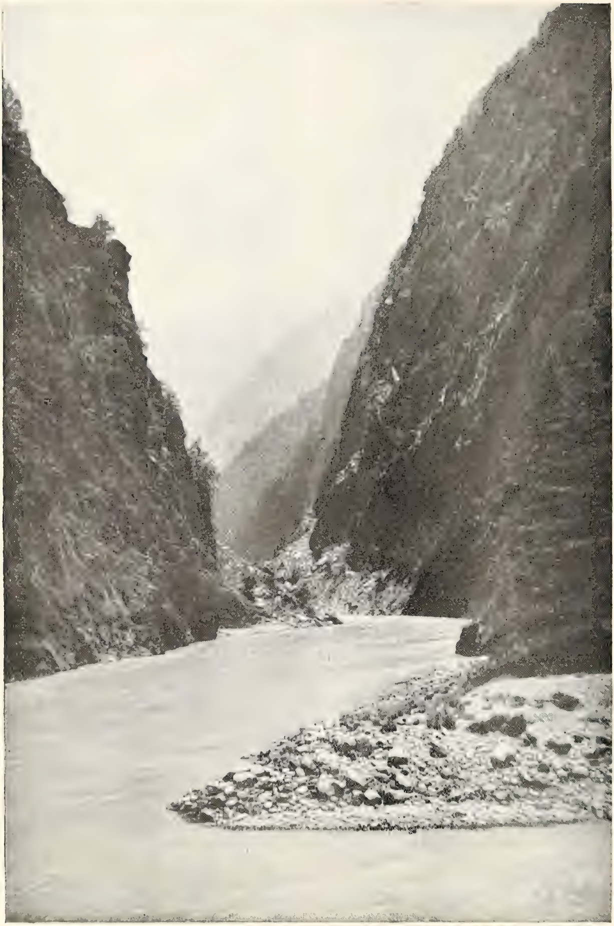
[2] More correctly 'seeds'.

Temple near Paunda

Pack sheep and goats near Nachar

Monastery, Nachar

Sangla Village



The confluence of the Sutlej and Baspa Rivers

Pandusar (19,000′). Straight up the Sutlej Valley to the right is a fine view of the Kailas Peaks. In front of the bungalow, on a lower terrace, are walnut and Spanish Chestnut trees, the latter an importation that does well in these parts.

Having left the main road with its slight but pernicious taint of civilisation I was now in unspoilt country among a primitive and courteous people. Certainly the atmosphere at Kilba was friendly for not only did the resthouse keeper refuse his legitimate dues for supplying me with a hot bath and firewood, but the range officer was most helpful and the compounder's son insisted on feeding me, giving me eggs for breakfast and a monal for dinner (let us forget that it was the close season for the latter), and generally entertaining me. This remarkable youth was busily learning Russian, contemplating walking to Rampur in one day, and training a body of guerilla troops to deal with goondas in the event of civil war. Although there was no trouble here when the disturbances broke out this activity was not as far fetched as I thought at that time.

Close to the bungalow there is the grave of a very young European child and I was much puzzled to know how it came to be there, as this is hardly the country into which to travel with a child in arms. However, I discovered that in days gone by, before the forests were leased by the Indian government, they were privately worked and that it was the grave of the small son of one of the local managers.

Grapes grow well here and a potent spirit is made from them. Although it is very fiery, it is not unpleasant and has a distinct taste of the grapes from which it is distilled.

IV

The Baspa Valley

Early on the morning of the 30th we set off for Sangla, leaving Don Quixote behind to recover. The road descends steeply to the Sutlej and then runs for two miles close beside the river, a comparatively tranquil stream here. Not far from its junction with the Baspa River is one of the celebrated 'jhula' bridges, a form of structure which fortunately I had no occasion to use. A strong wire is stretched tightly from one bank to the other and along it runs a wheel from which is suspended a wooded seat. The traveller, having commended his soul to providence, sits on this and, hanging on for his life, is pulled across the river. Sometimes rope is used instead of wire and this is even more alarming as the rope sags badly in the middle and sways violently from side to side.

The road turns up the Baspa Valley close to the point where the two rivers meet, a sombre but beautiful spot. The contrast between the waters of the two rivers is interesting: those of the Sutlej are dirty brown but those of the Baspa River are milky grey (a sign that they have their origin in a glacier), and after their confluence the two streams continue to run separately for a hundred yards or so before mingling.

The lower part of the Baspa Valley is very like other tributary valleys that I had seen. It is narrow and steep and the river rushes down it in a series of cascades and rapids. For the first thousand feet the track climbs through a sparse growth of Chilghoza pines but above that cedar forest is entered and it continues to run through this until the middle valley is reached.

Of butterfly life there was little (I repeat I was a month too early) but I caught two specimens of the *ligyes* race of the Indian White Admiral (*Limenitis trivena*) and a good series of the Mountain Argus (*Erebia shallada shallada*), neither of which had previously been recorded from this neighbourhood. The latter catch interested me especially, as I had always believed this to be a high elevation butterfly that flew about on the grassy mountain sides above 12,000′. Yet here it was between 6,500′ and 8,300′ (I saw none after leaving the lower valley) flying about in the shade of the forest just like the Common Argus . . . but unlike the Hybrid Argus, mentioned above, which keeps to open and preferably rocky country.

Lower down than this on my return I saw a *Lethe* which I failed to catch as it dived into some bamboo undergrowth. This was in all probability the Banded Treebrown (*Lethe confusa*) of which I have specimens from Nachar. Although common in many parts of the hills it is a rarity in the Simla region.

The track is bad and only just passable for mules, especially in one place where it has been overrun by a fine scree.

Shortly before I reached this spot I had a surprise. As I turned a sharp corner in a particularly gloomy piece of forest I saw in front of me what I took to be a bison! As I was preparing to move off in the opposite direction as unobtrusively as possible I realised that I was no longer in the South Indian jungles. I had another look and decided that it must be a yak . . . but I was again wrong for on closer inspection it proved to be a dzo[1] . . . doubtless an animal of many admirable domestic qualities but a nasty looking customer when blocking a very narrow path. However, having given us each a very dirty look, it hastened past, probably being even more startled to see us than we were to see him.

I had hoped to meet a few yaks at Sangla but they were up on the high pastures, even the moderate summer temperature of the valley being too warm for them.

After seven miles the river rushes down between two cliffs in a series of waterfalls and the track zig-zags steeply over the hill-side close to the right. At the top is a small tree-covered plateau and beyond and a little below me lay the beautiful valley I had come to see.

Without a doubt the valley was once a chain of lakes, probably formed by the moraines of glaciers flowing down from the south. I do not think that anything else can account for its topography which is so different from that of any other valley in this part of the Himalayas, for its floor is wide, perhaps a mile across in places, and is fairly level and set at a gentle slope. It is well cultivated and dotted with fruit and walnut trees. The northern side is dominated by two great peaks, the first (19,500′) above Sangla, and the second (21,150′), a very graceful mountain, some ten miles further on. This side of the valley is too steep to support much vegetation but the southern side, where the slopes are more gradual and the mountain tops are hidden, is thickly covered with fine cedar forest.

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[1] The cross between the yak and the domestic ox.

The valley has a great reputation in Kunawar for its fertility and the ease of life there. Indeed with its flat fertile fields and pleasant summer climate it must seem a promised land to other Kunawaris who, at best, can only scratch a miserable living from their steep hillsides.

Although, according to our standards, life in the valley is hard and the winter climate very severe, the inhabitants have plenty to eat, an abundance of firewood and are well clothed in their homespun garments. Being quite out of touch with the rest of the world they can have few worries, and pursue their Arcadian existence exactly as they have pursued it for hundreds of years.

The river is stocked with trout and I had hoped to have fish to eat at Sangla. I was disappointed, of course, because the river is flooded with snow water at this time of the year. October and March are the fisherman's months.

Although the villagers catch a few of the trout (by the poacher's time honoured method of tickling) the river is badly in need of fishing as many of the fish are now hoary old cannibals.

The valley is a sportsman's paradise, for in addition to fish in the river, there are Panther and Black Bear in the forest, as well as Koklas, Kalij, Monal and Tragopan Pheasant; and Brown Bear, Snow Leopard, Bharal, Musk Deer and Snowcock high up on the hillside. Furthermore, if anyone were hardy enough to shut himself up here for the winter (the valley is snowbound for three months), he would find fine skiing slopes on the southern side of the valley.

The bungalow, which is situated where the valley narrows and where the second of the lakes probably ended, is large and solid and was undoubtedly built as a fishing lodge for the recreation of lonely D.F.O's from Nachar. There can be no other reason for its presence in this remote spot for it has seldom been occupied and apparently only for that purpose. It is placed well above the river on the side opposite to the village, which is just over the way and is of a curious appearance resembling nothing so much as an untidy conglomeration of wooden boxes. Straight ahead, beyond the village and rising directly behind it, is the towering Sangla Peak with its magnificent crags and precipices. Directly behind the bungalow the hillside slopes steeply up into the forest, whose magnificent cedars are one of the glories of the valley. I saw many giant trees but the biggest of them all grew close by and was a gnarled old veteran whose girth at the base was 47 feet.

As it was still early spring in the valley the only butterflies that were about in any number were the Dark Clouded Yellow, the Indian Tortoiseshell and the Common Wall (*Pararge schakra*), so that I caught nothing of interest except a single specimen of the *ariana* (dry zone) race of the Common Meadow Blue . . . incidentally quite a different race from that flying nearer to Simla in the wet zone. But in July and early August the valley is a fine place for butterflies and many of those mentioned as coming from Shipki can be caught here, as well as the Silverstreak Fritillary (*Argynnis clara*), the most westerly point from which it has been recorded, and the Dusky Blackvein (*Aporia nabellica nabellica*).

The valley cannot be left without mention of the rest-house chowkidar, a wizened, friendly old gnome, who strongly resembled one of the seven dwarfs. In spite of his three score years and ten, on the day of my arrival this remarkable old person walked the 28 miles to Kilba and back (with the 3,000′ climb on the return) and was as lively as a cricket at the end of it.

V

The Return

The obvious and most direct way home, had I known about it when I planned my journey, was over the Rupin Pass (15,000′) directly opposite Sangla and to Khadrala via Rohru. But coolies are needed for this and also a tent. There would have been little difficulty over the former, but the latter I did not have with me.

There are also three other tracks leading out of the valley, all of which are impassable for mules, of which one leads over the shoulder of the Sangla mountain to Shongtong on the Sutlej, and thence across the river by jhula to Chini; a second crosses the Dhauladhar range above Chitkul to join the Rupin route, and a third goes to Gangotri over the very high pass at the end of the valley.

There is little to write about my return except that it was done at great speed and that towards the end I became very short of food. This was not due to overeating on my part but to Sheba's voracious appetite. When I came to weigh myself at the end of the trip I found that whereas I had lost 10 pounds, she had lost exactly eight ounces . . . which, I consider, goes to show considerable self-sacrifice on my part.

Indeed by the time we reached Bahli supplies were reduced to a little tea, a few walnuts (a present from Kilba) and a tin of fish. There, however, I bought what there was . . . two eggs and some very poor flour, which was so bad that Don Quixote had to forego his afternoon sleep and spend an hour or so in picking the weevils out of it.

At Bahli I was most interested to see half an acre of potatoes which had been stripped of their leaves overnight by a beetle of perhaps three quarters of an inch in length with a purple-brown body and a red head. It looked like a Cantharid, but, most unfortunately, the specimens I collected in a match box escaped before I could give them their quietus. It is more than probable that the habits of this beetle are well known, but if not it is one of which the authorities may well beware, as a serious plague of it might ruin the potato crop, the chief export of these hills.

The state of supplies being what it was it was essential for me to return as quickly as possible, so I did a double stage the next day and completed the 21 miles to Khadrala by 1 p.m.

Never has anyone been made less welcome than I was in the forest rest-house at Khadrala. In this they were within their rights as I had no pass (though no objections on this score had been raised at Sangla, Nachar and Kilba) but they were certainly at fault in trying to charge me one rupee for a quart of water . . . all that I was able to persuade them to supply me with!

Having eaten my last sour chapati and delivered myself of a few wingéd words to the chowkidar, I left at dawn the next morning and, breakfasting hurriedly but very well at Bagi, arrived at Narkanda before noon.

The return to Chharabra by 'bus was even worse than my outward journey, as the driver was a popular soul with many friends on the road. However, every journey comes to an end sometime and I arrived at Wildflower Hall just as the sun was setting.

APPENDIX

Additions to The List of Butterflies of the Simla Hills (See Vols. 41, No. 4; 45, No. 2; 46, No. 4).

295. *Tros* (*Polydorus*) *philoxenus philoxenus*, Gray. Recorded from Simla in June.

296. *Limenitis trivena ligyes*, Hew. Baspa Valley, 31-5-1947, 6,000 ft. to 7,000 ft.

297. *Limenitis trivena* race nova? Chaura, 28-5-1947, 6,500 ft. Intermediate between *pallida* and *ligyes*. UPH white discal band 5 mm.; marginal spots obscure. UPF basal spot in 1b. present but not joined to discal band. Above and below considerably darker than pallida. Unfortunately only one specimen was caught so that it cannot be stated whether this is typical of a local race or is only an aberration.

298. *Polyommatus eros* race nova. This race flies in the wet zone and is not uncommon between Matiana and Sungri. It is very different from the dry zone race, *ariana*. UNH discal white streak is absent and the marginal orange spots are very prominent.

(*Euploea midamus*. There is a report, from a reliable source, that this butterfly was caught in Simla in 1947. As it has hitherto not been caught, as far as I know, any nearer than Sikkim, more definite proof is needed before it can be included in the list.)

Notes

86. *Erebia shallada shallada*, Lang. Common in forest, 6,500 ft. to 8,000 ft. in the lower Baspa Valley on 31-5-1947 and 2-6-1947.

249. *Celaenorrhinus munda*, Moore. Apparently not rare at Bahli and below Sungri at the end of May and in early June between 7,500 ft. and 8,000 ft. Previously included in the list on the authority of a doubtful specimen. At first sight the species is extremely like *C.leucocera* but is easily distinguished as follows:—UPH is plain; antennae shafts are chequered and club white tipped in both sexes; spot in 3 UPF joins the spot in cell and in 2, and reaches base 3.

280. *Parnassius stoliczkanus* race nova. Listed previously (with a query) as *P. delphius stenosemus*, but is almost certainly not that race. The main characteristics are that the black markings are very clearly defined and that the discal spot in 2 HW is always, and the large spot in 5 is generally, entirely black. (Out of 13 specimens the latter spot is red-centred in one instance only; in one or two others it bears a few red scales). From Shirang La in July.

LOCAL LISTS OF LEPIDOPTERA FROM THE PUNJAB AND U.P.

BY

D. G. SEVASTOPULO, F.R.E.S.

Rereading back numbers of this Journal recently, I have been struck by the almost complete absence of local lists of Moths. There have been a few records of individual occurrences, usually of economic pests or striking species, but, apart from Col. Mosse's list of the Sphingidae of Kathiawar (Vol. xxxiii, 888), the only local lists from 1924 to date are my two lists of the Calcutta Pyralidae (Vols, xxxviii, 204, and xl, 132) and my very short list of March Lepidoptera at Gopalpur (Vol. xlii, 211).

The Journal of the Darjeeling, now the Bengal Natural History Society contains rather more of these lists, but here again, apart from a serial paper by Col. Scott on the Sphingidae likely to occur in the Darjeeling Hills, the only contributor from 1932 to date is myself. My papers comprise three lists and a supplement of the Moths of Darjeeling (Vols. x, 59; x, 134; xi, 28, and xiii, 91), a list and supplement of the Lepidoptera of Peshoke, December 1936 (Vols. xii, 73, and xiii, 90), a list of the Moths of Calcutta (Vol. xix, 43) and one of the Moths of Tukdah, May/June 1944 (Vol. xx, 20), and I have a further paper on the moths of Tukdah, October/November 1945 and one on a collection of moths from Baheri in the Darbhanga District in course of publication.

In view of this paucity of records, I have been tempted to publish lists of the species in my collection caught in the Punjab and U.P. during my first spell in India. During this period I was stationed in Amritsar from January to November 1925, in Lyallpore from November 1925 to March 1927 and in Cawnpore from November 1927 to March 1929, and made three short trips to the hills, to Murree in September 1925 and August 1928 and to Naini Tal in June 1926.

These lists are unfortunately very far from complete. Apart from the fact that my collecting technique had not been fully adjusted to Indian conditions, I did not realise in those days how little was known of the insects of India, and felt that an amateur, particularly an ignorant one—my only book at that time was Antram's *Butterflies of India*—could produce little work worth publishing. Consequently I kept no records, and the lists given below are compiled from specimens still existing in my collection. It must not be assumed that because a particular species is not mentioned as occurring in, say, Lyallpore, it was not met with there. During the last twenty years or so, many specimens have been discarded or disposed of as duplicates, and also, when an adequate series had been accumulated, further captures were not made.

As mentioned above, these lists are very far from complete, but I think that positive records, however few, are better than no records at all. For this reason I have also included the butterflies. The lists are given in four sections, Amritsar and Lyallpore together, the two visits to Murree, Cawnpore and Naini Tal.

I have followed Evans's *Identification of Indian Butterflies* (2nd edit.) and Hampson's *Fauna of British India*, Moths, i–iv, as regards classification, modernising them with the aid of Talbot's *Fauna of British India*, Butterflies, i (2nd edit.), Hampson's *Catalogue of the Lepidoptera Phalaenae*, Seitz's *Indo-Australian Lepidoptera* and Bell & Scott's *Fauna of British India*, Moths, v. The numbers before the names correspond with Evans's and Hampson's Fauna numbers, except that I have used the numbers of the Fauna, vol. v, for the Sphingidae with the addition of the initial S.

A. AMRITSAR, JANUARY/NOVEMBER 1925, LYALLPORE, NOVEMBER 1925/MARCH 1927.

RHOPALOCERA

PAPILIONIDAE

A 4-25 *Papilio polytes* L., *romulus* Cr.—Common in Amritsar, females of all three forms, ***stichius*** Hbn., ***cyrus*** F. and ***romulus*** Cr., occurring. No Lyallpore specimens, but I am certain it existed there.

A 4-27 *Papilio demoleus* L., *demoleus*—Common at both places.

PIERIDAE

B 4-10 *Pieris canidia* Sparr., *indica* Evans—Common at Amritsar before the weather gets hot.

B 8 *Anapheis aurota* F., *aurota* (*Belenois mesentina* Cr.)—Common at both Amritsar and Lyallpore.

B 11- 1 *Catopsilia crocale* Cr.—Common at Amritsar, no Lyallpore specimens but it almost certainly occurred there.

B 11- 2 *Catopsilia pomona* F.—Common at both places.

B 11- 4 *Catopsilia pyranthe* L., *minna* Herbst.—Common at Amritsar, no Lyallpore examples but almost certainly occurred there.

B 11- 5 *Catopsilia florella* F., *gnoma* F.—One Amritsar specimen.

B 15- 2 *Eurema* (*Terias*) *laeta* Bsd., *laeta*.—Two from Amritsar.

B 15- 5 *Eurema* (*Terias*) *hecabe* L., *fimbriata* Wall.—Common at both places.

B 16- 9 *Colias erate* Esp., *erate*.—Common in Amritsar during the early part of the year. Also forms ***glicia*** Fruhs. and ***pallida*** Stg.

B 16-14 *Colias electo* L., *fieldii* Men.—Common at Amritsar in the early part of the year.

B 18- 1 *Colotis amata* F., *amata*—Common at Lyallpore.

B 18- 2 *Colotis protractus* Btlr.—One from Lyallpore.

B 18- 3 *Colotis vestalis* Btlr.—Common at Lyallpore.

B 18- 5 *Colotis etrida* Bsd., *etrida*.—Two from Amritsar and one from Lyallpore.

DANAIDAE

C 2- 9 *Danaus limniace* Cr., *mutina* Fruhs.—Uncommon at Amritsar.

C 2-15 *Danaus chrysippus* L.—No specimens from either place, but was certainly common at Amritsar and, I think, at Lyallpore also.

C 3- 7 *Euploea core* Cr., *core*.—Common at Amritsar, also one example of *vermiculata* Btlr. No Lyallpore specimens and I do not remember it there.

SATYRIDAE

D 14- 2 *Ypthima inica* Hew.—Common at Amritsar, all f. *ariaspa* Moore, the wet season form.

D 22- 1 *Melanitis leda* L., *ismene* Cr.—Fairly common at both places, all the wet season form *determinata* Btlr.

NYMPHALIDAE

I have no specimens at all of this family from Lyallpore, although I think it probable that the *Precis* species found in Amritsar also occurred at Lyallpore.

F 18–14 *Euthalia garuda* Moore, *anagama* Fruhs.—Common at Amritsar.

F 30– 1 *Hypolimnas misippus* L.—Fairly common at Amritsar.

F 30– 2 *Hypolimnas bolina* L.—Fairly common at Amritsar.

F 35– 2 *Precis orithya* L., *swinhoei* Btlr.—Common at Amritsar.

F 35– 3 *Precis lemonias* L., *persicaria* Fruhs.—Common at Amritsar.

F 35– 4 *Precis almana* L., *almana*—Common at Amritsar.

F 36– 1 *Vanessa cardui* L.—Common at Amritsar in the cold weather.

F 42– 1 *Atella phalanta* Drury.—Fairly common at Amritsar.

LYCAENIDAE

I have no specimens of this family from Lyallpore, but *C. boeticus* almost certainly occurred, even if nothing else did.

H 12– 9 *Tarucus nara* Koll.—Amritsar, fairly common.

H 24– 4 *Zizeeria lysimon* Hbn.—One specimen from Amritsar.

H 25– 1 *Euchrysops cnejus* F.—Fairly common at Amritsar.

H 28 *Cosmolyce* (*Lampides*) *boeticus* L.—Very common at Amritsar.

HESPERIIDAE

I 91– 2 *Astycus pythias* Mab., *bambusae* Moore.—Two Amritsar specimens.

HETEROCERA

The rather better showing of moths at Amritsar in comparison with Lyallpore is due, I think, to the fact that, whilst Amritsar had electric light, Lyallpore had nothing but oil-lamps.

SYNTOMIDAE

412 *Amata* (*Syntomis*) *cyssea* Cr. ab. *georgina* Btlr.—Three from Amritsar.

455. *Eressa* (*Syntomis*) *confinis* Wlk.—Common at Amritsar.

ARCTIIDAE

1153 *Aganais* (*Hypsa*) *ficus* F.—One from Amritsar.

1155 *Digama hearseyana* Moore.—One from Amritsar.

1232 *Amsacta* (*Creatonotus*) *moorei* Btlr.—Two from Amritsar.

1235 *Amsacta* (*Creatonotus*) *lactinea* Cr.—One from Amritsar.

1231 *Creatonotus gangis* L. (*interruptus* Gmel.)—Fairly common at Amritsar.

1279 *Utetheisa* (*Deiopia*) *pulchella* L.—One from Amritsar.

LYMANTRIIDAE

982 *Laelia exclamationis* Koll.—Three from Amritsar.

EUPTEROTIDAE

68 *Eupterote undata* Blanch.—Common at Amritsar.

SPHINGIDAE

S 2 *Acherontia styx* Westw.—One from Amritsar.

S 3 *Herse convolvuli* L.—Common at Amritsar. A rather smaller and paler form than that from Bengal.

S 8 *Psilogramma menephron* Cr., ab. *vates* Btlr.—One from Amritsar.

S 78 *Deilephila nerii* L.—Two bred from ova from Lyallpore.

S 109 *Nephele didyma* F.—Common at Amritsar. Also f. *hespera* F.

S 144 *Rhopalopsyche nycteris* Koll., *nycteris*.—Two from Amritsar.

S 148 *Celerio lineata* F., *livornica* Esp.—One from Lyallpore

S 151 *Hippotion celerio* L.—Fairly common both at Amritsar and Lyallpore.

NOCTUIDAE

2017 *Tarache lucida* Hufn.—Fairly common at Amritsar.
2630 *Enmonodia shiva* Guen.—One from Amritsar.
2629 *Speiredonia retorta* L.—Fairly common at Amritsar.
2507 *Parallelia mirabilis* Staud.—One from Amritsar.
2575 *Chalciope hyppasia* Cr.—One from Amritsar.
2664 *Phytometra nigrisigna* Wlk.—Two from Lyallpore.
2678 *Phytometra orichalcea* F.—Two from Lyallpore.

GEOMETRIDAE

3357 *Buzura suppressaria* Guen.—Fairly common at Amritsar.

B. MURREE, SEPTEMBER 1925 AND AUGUST 1928.

RHOPALOCERA

PAPILIONIDAE

A 4–29 *Papilio machaon* L., *asiatica* Men.—Fairly common in 1925.

Although I now have no specimens of any *Polydorus* from Murree I am fairly confident that one species, probably *P. philoxenus* Gray, *philoxenus*, was fairly common.

PIERIDAE

B 4– 7 *Pieris napi* L., *ajaka* Moore—Fairly common in 1928.
B 4–10 *Pieris canidia* Sparr., *indica* Evans—common on both visits.
B 4–11 *Pieris brassicae* L., *nepalensis* Dbl.—Common in 1925, no specimens in 1928.
B 14– 1 *Gonepteryx rhamni* L., *nepalensis* Dbl.—Common on both occasions.
B 14– 3 *Gonepteryx mahaguru* Gistel, *mahaguru* (*aspasia* Men., *zaneka* Moore).—One in 1925.
B 16–14 *Colias electo* L., *fieldii* Men.—Common on both visits.

SATYRIDAE

D 4– 2 *Pararge schakra* Koll.—Common on both visits.
D 11– 3 *Aulocera swaha* Koll., *swaha*—Common both times.

NYMPHALIDAE

F 25– 8 *Pantoporia opalina* Koll., *opalina*—Common on both occasions.
F 26– 6 *Neptis hylas* L., *astola* Moore—Common in 1925. One *varmona* Moore in 1925.
F 36– 1 *Vanessa cardui* L.—Common in 1925.
F 36– 4 *Vanessa canace* L., *himalaya* Evans—Two in 1925.
F 36–10 *Vanessa cashmirensis* Koll., *cashmirensis*—Common on both occasions.
F 39– 2 *Argynnis childreni* Gray, *sakontala* Koll.—One in 1925.
F 39– 3 *Argynnis kamala* Moore—One in 1925.
F 39– 8 *Argynnis lathonia* L., *issoea* Dbl.—Fairly common in 1925.
F 42 *Atella phalanta* Drury—Fairly common in 1928.

ERYCINIDAE

G 1– 2 *Libythea lepita* Moore, *lepita*—Two in 1928.
G 3– 1 *Dodona durga* Koll.—Fairly common in 1925.
G 3– 3 *Dodona eugenes* Bates, *eugenes*—Two in 1925.

LYCAENIDAE

H 14– 2 *Azanus uranus* Btlr.—One in 1928.
H 21–13 *Lycaenopsis vardhana* Moore—One in 1925.
H 21–22 *Lycaenopsis huegelii* Moore, *huegelii*—Fairly common in 1928.
H 22–27 *Polyommatus eros* O., *pseuderos* Moore—Fairly common both in 1925 and 1928.
H 34– 2 *Lycaena phlaeas* L., *indicus* Evans—Fairly common in 1928.
H 35– 1 *Heliophorus sena* Koll.—Fairly common in 1928.

H 83– 1 *Deudoryx epijarbas* Moore, *ancus* Fruhs.—Uncommon on both visits.
H 85–20 *Rapala micans* Brem., *selira* Moore—Not uncommon in 1928.

HETEROCERA

Zygaenidae

473 *Epizygaena cashmirensis* Koll.—Common in 1925.
525 *Eterusia pulchella* Koll.—Common in 1925, ♂ f. *leptalina* Koll., ♀ f. *cicada* Fldr.
602 *Agalope hyalina* Koll.—One in 1928.

Arctiidae

1179 *Diacrisia casigneta* Koll.—One in 1928.
1190 *Diacrisia unifascia* Wlk.—One in 1928.
1218 *Diacrisia leopardina* Koll.—One in 1928, determination not absolutely certain.

Lymantriidae

1033 *Lymantria concolor* Wlk., *superans* Wlk.—One in 1925.
1077 *Euproctis guttata* Wlk.—One in 1928.

Drepanidae

699 *Macrocilix mysticata* Wlk.—One in 1928.

Saturniidae

1 *Actias selene* Hbn.—One in 1925.

Sphingidae

S 149 *Pergesa elpenor* L., *rivularis* Btlr.—One in 1928.

Geometridae

3879 *Scopula cleoraria* Wlk.—One in 1928.

C. CAWNPORE, NOVEMBER 1927 TO MARCH 1929

RHOPALOCERA

Papilionidae

I have no Cawnpore specimens of any *papilio*, but it is almost certain that both *P. polytes* and *P. demoleus* occurred.

Pieridae

B 1 *Leptosia nina* F., *nina*.—Not common.
B 6– 1 *Delias eucharis* Drury.—One only.
B 8 *Anapheis aurota* F., *aurota*.—Fairly common.
B 9– 2 *Cepora* (*Huphina*) *nerissa* F., *phryne* F.—Fairly common.

I have no Cawnpore specimens of either *Catopsilia* or *Eurema*, but it is almost certain that at least *C. crocale*, *C. pomona*, *C. pyranthe* and *E. hecabe* occurred.

Danaidae

C 2–12 *Danaus plexippus* L.—One example.
C 2–15 *Danaus chrysippus* L.—Common.
C 3– 7 *Euploea core* Cr., *core*.—Almost certainly occurred, but I have no specimens.

Satyridae

D 22– 1 *Melanitis leda* L., *ismene* Cr.—Fairly common.

Nymphalidae

F 30- 1 *Hypolimnas misippus* L.—Fairly common.
F 35- 1 *Precis hierta* F., *hierta*.—Common.
F 35- 2 *Precis orithya* L., *swinhoei* Btlr.—Common.
F 35- 3 *Precis lemonias* L., *vaisya* Fruhs.—Common.
F 35- 4 *Precis almana* L., *almana*.—Common.

Erycinidae

G 4- 5 *Abisara echerius* Stoll., *suffusa* Moore.—Uncommon.

Lycaenidae

H 12- 9 *Tarucus nara* Koll.—Common.
H 13 *Syntarucus plinius* F.—Common.
H 24- 1 *Zizeeria trochilus* Frr., *putli* Koll.—Common.
H 24- 3 *Zizeeria maha* Koll., *maha*.—Common.
H 24- 4 *Zizeeria lysimon* Hbn.—Common.
H 24- 5 *Zizeeria gaika* Trim.—Common.
H 24- 6 *Zizeeria otis* F., *decreta* Btlr.—Common.
H 28 *Cosmolyce beeticus* L.—Common.

Hesperiidae

I 47- 1 *Suastus gremius* F., *gremius*.—Fairly common.

HETEROCERA

Arctiidae

1155 *Digama hearseyana* Moore.—One.
1232 *Amsacta moorei* Btlr.—One.
1239 *Amsacta lineola* F. (*Creatonotus emittens* Wlk.) —One.
1279 *Utetheisa pulchella* L.—One.

Sphingidae

S 109 *Nephele didyma* F.—Fairly common, also f. *hespera* F.
S 151 *Hippotion celerio* L.—Fairly common.

Limacodidae

859 *Parasa lepida* Cr.—One.

Noctuidae

1622 *Euxoa spinifera* Hbn. (*Agrotis biconica* Koll.)—Fairly common
1913 *Sideridis unipuncta* Haw.—Common
1601 *Chloridea obsoleta* F. (*Heliothis armigera* Hbn.)—One.
2516 *Anua* (*Ophiusa*) *tirrhaca* Cr.—One.
2505 *Parallelia* (*Ophiusa*) *algira* L.—One.
2573 *Mocis undata* F. (*Remigia archesia* Cr.).—One.
2532 *Serrodes campana* Guen. (*inara* Cr.).—One.

Geometridae

3279 *Hyperythra lutea* Guen.—One.

Yralidae

4813 *Ercta ornatalis* Dup.—One in February 1934.
5073 *Leucinodes orbonalis* Guen.—One in February 1934.
5150 *Nomophila noctuella* Schiff.—One in February 1934.

D. NAINI TAL, JUNE 1926.

RHOPALOCERA

Papilionidae

A 2–16 *Polydorus dasarada* Moore, *ravana* Moore.—One.

Pieridae

B 4–10 *Pieris canidia* Sparr., *indica* Evans.—Common.
B 5– 2 *Aporia leucodice* Ev., *sara* Evans.—Common.
B 5– 5 *Aporia agathon* Gray. *ariaca* Moore.—Common.
B 14– 1 *Gonepteryx rhamni* L., *nepalensis* Dbl.—Fairly common.

Danaidae

C 2– 1 *Danaus aglea* Cr., *melanoides* Moore.—Fairly common.

Satyridae

D 3– 3 *Lethe sidonis* Hew., *sidonis*—Common.
D 3–44 *Lethe verma* Koll., *verma*—Common.
D 3–50 *Lethe yama* Moore, *yama*—Two.
D 4– 1 *Pararge schakra* Koll.—Common.
D 13– 4 *Erebia nirmala* Moore, *nirmala*—Common.
D 14– 4 *Ypthima nareda* Koll., *nareda*—Common.
D 14–21 *Ypthima sakra* Moore, *nikoea* Moore.—Common.

Nymphalidae

F 2– 7 *Eriboea dolon* Westw., *dolon*—Three, all drowned in the lake.
F 9– 1 *Sephisa dichroa* Koll.—Two.
F 18-26 *Euthalia patala* Koll., *patala*.—Common.
F 25– 8 *Pantoporia opalina* Koll., *opalina*—Fairly common.
F 26–2 *Neptis yerburyi* Bltr., *yerburyi*—Not uncommon.
F 26– 6 *Neptis hylas* L., *astola* Moore.—Common.
F 26–23 *Neptis narayana* Moore, *narayana*—One.
F 27– 4 *Thyrestis thyodamas* Bsd., *ganescha* Koll.—Common.
F 36– 4 *Vanessa canace* L., *himalaya* Evans.—Fairly common.
F 39– 3 *Argynnis childreni* Gray, *childreni*.—Fairly common.

Erycinidae

G 3– 1 *Dodona durga* Koll.—Fairly common.
G 3- 2 *Dodona dipoea* Hew., *nostia* Fruhs.—Fairly common.

Lycaenidae

H 34– 2 *Lycaena phlaeas* L., *indicus* Evans.—Fairly common.
H 34– 1 *Lycaena pavana* Koll.—Two.
H 35– 1 *Heliophorus sena* Koll.—Common.
H 49–65 *Arhopala* (*Amblypodia*) *ganesa* Moore, *ganesa*.—Three.

HETEROCERA

Zygaenidae

586 *Campylotes histrionicus* Westw.—One.

Syntomidae

411 *Amata* (*Syntomis*) *bicincta* Koll.—Common.

Arctiidae

1179 *Diacrisia casigneta* Koll.—Fairly common.
1218 *Diacrisia leopardina* Koll.—Two.
1215 *Estigene* (*Alphaea*) *imbuta* Wlk.—Two.
1216 *Estigene* (*Alphaea*) *quadriramosa* Koll.—One.
1229 *Pericallia* (*Areas*) *imperialis* Koll.—One.

LYMANTRIIDAE

1011 *Dasychira bhana* Moore—Common.

EUPTEROTIDAE

69 *Eupterote fabia* Cr.—Fairly common.

BRAHMAEIDAE

32 *Brahmaea wallichii* Gray—Fairly common.

SPHINGIDAE

S 32 *Clanis deucalion* Wlk.—One.
S 70 *Haemorrhagia saundersi* Wlk.—One.
S 84 *Ampelophaga rubiginosa* Brem., *fasciosa* Moore—One.
S 118 *Macroglossum bombylans* Bsd.—One.
S 155 *Theretra nessus* Drury—Fairly common.
S 164 *Theretra oldenlandiae* F.—One.
S 178 *Rhagastis albomarginatus* Roths.—Not uncommon.

NOTODONTIDAE

1049 *Gazalina chrysolopha* Koll.—Fairly common. (N.B.—This species is not a Lymantriid.)

NOCTUIDAE

1968 *Diphtherocome discibrunnea* Moore—One.
1726 *Euplexia semifascia* Wlk., *cuprea* Moore—One.
2408 *Nyctipao glaucopis* Wlk.—Not uncommon.
2646 *Calpe ophideroides* Guen.—Common.

GEOMETRIDAE

3516 *Abraxas sylvata* Scop.—One.

METHODS OF COLLECTION AND HATCHING OF CARP OVA IN CHITTAGONG WITH SOME SUGGESTIONS FOR THEIR IMPROVEMENT

BY

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(*With 5 text figures*)

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INTRODUCTION

Bengal as a maritime province, rich in rivers, possesses an immense fisheries potential merely waiting to be tapped by scientific methods. As is fairly well known the major carps of this country, namely, Rohi (*Labeo rohita*), Catla (*Catla catla*), and Mrigal (*Cirrhina mrigala*) as well as others breed prolifically in rivers during the monsoon. But a fair quantity of the ova shed is carried down to saline waters in such rivers as are subjected to tidal influence. In other rivers, large quantities of spawn get blocked in nullahs, ditches and paddy fields, etc., after floods. In either case ova, larvae and fry capable of providing fish food to thousands of people perish owing to unfavourable physical conditions or are devoured by animals.

A start has already been made to save this food for the teeming millions as ova and larvae in larger numbers are collected from rivers to stock the innumerable stretches of cultivable waters scattered all over the country.

The spawn collectors of Chittagong use crude methods for the collection of ova from streams and for hatching. To examine the possibilities of improving upon these crude methods. I conducted investigations at the suggestion of Dr. S. L. Hora. The importance of the problem will be clear when it is known that in 1945 alone, 13,040 *handis* containing approximately 30,00,00,000 (30 crores) fry were exported from this area and about two thousand persons were actually engaged in the collection of ova and very many more in the hatching and transport of resultant fry. From the information now available it has been found that 10,160 *handis* of fry were exported from this district in 1946 and 11,799 *handis* in 1947.

I am indebted to Dr. S. L. Hora, Director of Zoological Survey of India (formerly Director of Fisheries, Bengal), for inviting me to investigate this important problem and for his guidance ungrudgingly given, whenever needed. I am also thankful to Messrs. M. Huq and Zain-ul-Abedin, Fishery Overseers of this Directorate, for their assistance during my investigations.

MAIN SPAWN COLLECTION CENTRES

In this province there is a fairly established and flourishing fish fry trade. The important collecting centres of eggs, larvae and fry are numerous and far apart but for convenience of consideration are grouped into the following main zones by Rahman (p. 5):

(1) *Rajshahi zone*, comprising the left bank of the Padma (or the Ganges) covering a distance of about 60 miles from Godagari Ghat to Sarda and small pockets of rivers Jumna near Seraiganj and the Padma near Raita.

(2) *Murshidabad zone*, comprising the right bank of the Padma, from Dhulian to Lalgola Ghat, a distance of about 40 miles, and also the whole length of the Bhagirathi which passes through Murshidabad and Nadia districts: and

(3) *Chittagong zone*, comprising the zig-zag course of the river Halda, a distance of about 16 miles within the Sadar subdivision. Unlike the first two zones fertilized ova only are collected here.

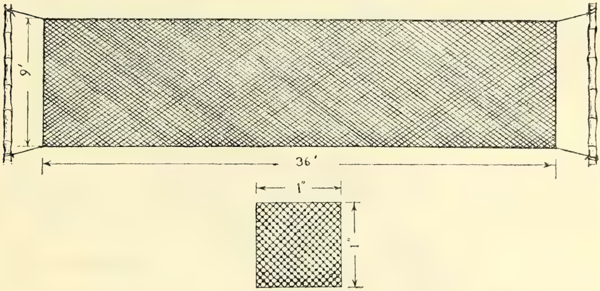
The investigations made in the third zone, viz., the river Halda and the information collected there form the subject matter of this short paper. The work done at the river is far from complete and will be continued until fairly complete success is achieved and the spawn collectors have learnt the improved technique.

In the first two zones larvae and fry of varying sizes are collected while in the third zone only fertilized ova are collected. Study of ova collected from the Halda in April, 1946, revealed that they were in various stages of development. The age of the most highly developed embryos collected from the stream, on comparison with the corresponding stages of some other fishes, was found to be about 12-14 hours. It was clear from the study that spawning had occurred about 12-14 hours earlier.

Here I wish to state that in the Halda maunds of eggs are shed every year and with the limited food supply in the river, one can safely say that if all the ova could be prevented from going to saline water or perishing otherwise, even then only a very small fraction of this number could be grown to maturity.

Description of collecting nets

The collecting net (Text-fig. 1) is a simple rectangular sheet of mosquito curtain measuring from 36-39 feet in length and 9 feet in depth. The sheet is laced with strong ropes all round. The shorter ends of the net are tied to two vertical bamboo poles, each about 8 feet in length (Text-fig. 1). The two poles are held by two spawn collectors sitting at the opposite ends of the boat, to the sides of which the poles are fixed by the help of wooden hooks for additional support. The net is then lowered into the water in such a way that it remains behind the boat and does not get entangled. As soon as the net is lowered, by the force of the current, it forms a bag-like hollow in which ova collect. The net is lifted when sufficient ova gather. This process is repeated till a sufficient quantity of eggs are obtained.



Text-fig. 1.

Spawning grounds and collection areas

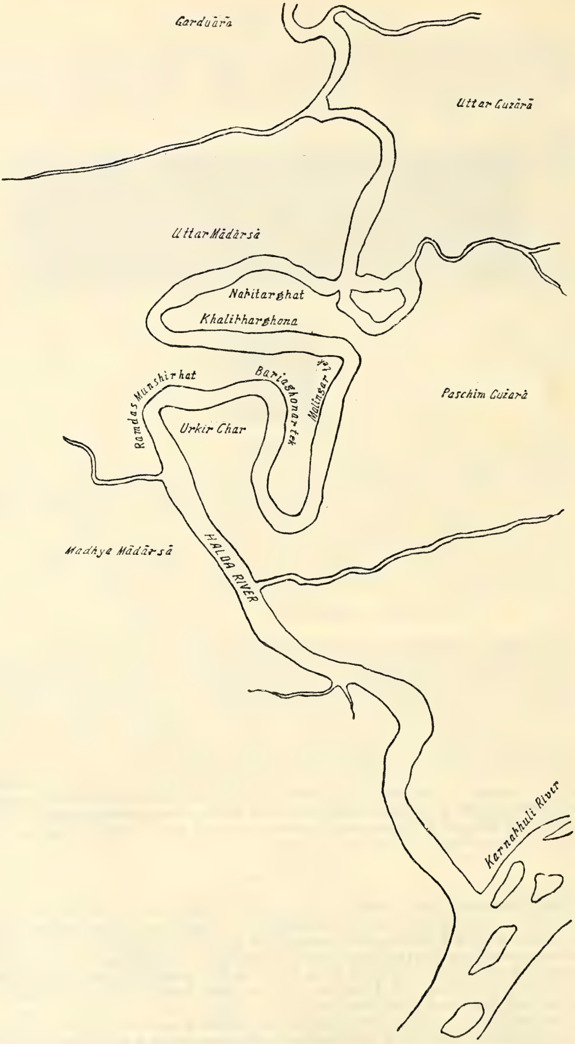
The major carps of the rivers breed at suitable places in freshwater and in the Halda at select places free from the influence of salinity. The favourite localities (Text-fig. 2), where the fish are said to breed are Napitarghat, Khalipharghona, Malingar tek and Bariaghonar tek. Mostly, the people of Paschim Guvarā, Urkirchar and Uttar Mādārsā, living on and near the banks of the Halda, collect the spawn. This area covers a distance of about 10 miles, extending from Napitarghat to Ramdas Munshirhat.

The spawn collectors fix their nets during the spawning season at suitable spots in the river and examine them after short intervals. As soon as some ova are spotted, it becomes clear that the fish are breeding or have already bred. The spawn is collected upto about 14 hours after spawning, after which the quantity of spawn decreases and further attempt at collection is not made.

Spawning season

'The spawning day generally falls within three days prior to or after full-moon or new-moon during the months of April to July, but the time for spawning is not fixed' (Majumdar, 1940 p. 735). There may be as many as four spawnings in the year, as for example, fish spawned on the 12th April, 10th and 26th May and 10th June in the year 1945, on the 1st and 30th April, 17th May and from the 10th to 12th June in the year 1946 and on the 23rd April and 23rd May during this year.

The belief that fish spawn only during night is not borne out by facts. The spawning in the bund at Bankura took place at 7 a.m. on the 14th of July, 1946, in the Halda about 5 p.m. on the 30th April, 1946. Further, *Labeo gonius* was seen spawning at 7.10 a.m. on the 20th July, 1933 (Ahmad,


Garduārā
Uttar Guzārā
Uttar Mādārsā
Nahitarghat
Khalibharghona
Ramdas Munshirhat
Bariaghonartek
Malinsartek
Paschim Guzārā
Urkir Char
Madhya Mādārsā
HALDA RIVER
Karnaphuli River

Scale 1″ = 2 Miles

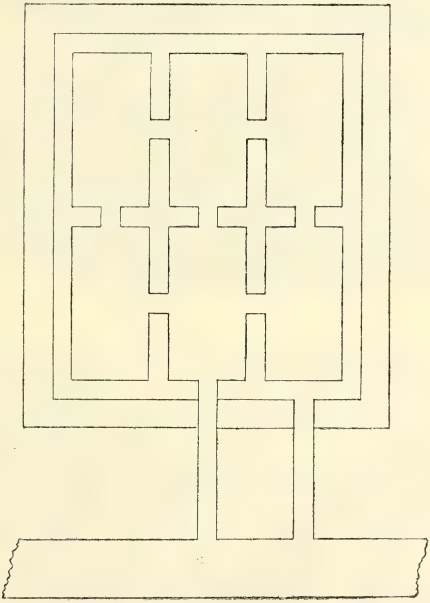
Text-fig. 2

1944, p. 344), and Khan (1945, pp. 316-18) and several other workers have also made similar observations. It is clear, therefore, that it is immaterial whether it is night or day, for fish shed ova as and when conditions become favourable. It seems to be true, however, that bright sunlight does not favour spawning, probably because it raises the temperature of the water and therefore the eggs are not laid during bright sunny days.

It has also been noticed that the fish settle at the bottom and do not show much sexual activity, when there is a heavy shower of rain. This may be due to the fact that heavy rain greatly agitates the water, making it unsuitable for the time being for shedding ova. After heavy rain, which brings about flood and is responsible for inundating low lying areas near the banks, the fish finding these and other favourable conditions migrate to the proper places to spawn.

Artificial beds (*Hapas*), their arrangement and description

Hapa (text-fig. 3) is the familiar vernacular term for beds scooped out on the banks of a river. The *hapas* referred to in this article are situated on the banks of the river Halda and its tributaries. A number of *hapas* are prepared at a place and are arranged according to the supply of water.



Text-fig. 3

In some places there are single rows of *hapas*, while in others there are double rows, one row lying on the river side and the other away from it. The front row of *hapas* is directly connected with the river either by a simple cutting in the earth or by bamboo pipes or by other types of wooden drains while the second row gets water through the front row of *hapas* (text-fig. 3). The drains are used to fill water into the hapas when the level of water in the river is higher than in the hapas and for draining them, when the level of water is lower in the stream. That is how occasionally aeration of water in the *hapas* is maintained. Drainage system varies greatly in different cases but mostly the arrangement of *hapas* and the drainage system places is as shown in the figure.

The *hapas* can be used for one or more years depending upon the consistency of the soil in which these are formed. In loose soil the *hapas* are excavated annually but *hapas* in firm earth last several years. The *hapas* are properly plastered with mud and dried before they are used. Proper operation of the drainage is also ensured. Measurement of several hundred *hapas* established that their average dimensions were 16×8×1½ feet.

METHODS OF COLLECTION

In the boat, the collectors erect two mud walls, enclosing a small area, making something like a small *hapa*. This enclosure is filled with water. In the enclosure thus formed eggs collected from the stream are transferred for development, which is accompanied, however, by a great loss of eggs owing to congestion and the want of proper aeration. The number of eggs so lost depends on the time factor. If eggs are collected in a short time and they are transferred to proper *hapas*, the mortality will be less but if collection takes a long time the result will be disastrous.

CONDITION OF SPAWN AT COLLECTION TIME

The ova at the time of collection are found to be in various stages of development. Each looks like a bead with a big balloon-like covering, formed as the result of suction of water into the space between the egg and its membrane. As the egg is slightly heavier than water, it settles down when shed in comparatively still water. The water absorbed serves as a medium for the protection of the developing embryo from external injuries as well as respiration before the larva hatches. After the embryo is almost fully formed this water serves yet another important function. The embryo here takes to swimming for the first time and there is no chance of its drowning. This is an important provision for the safety of the little ones before they come in direct touch with the external world. Thus, Nature has furnished a lesson to the fish farmers not to introduce the tiny, inexperienced and feeble larvae and fry straightaway into the deep water and endanger their very existence.

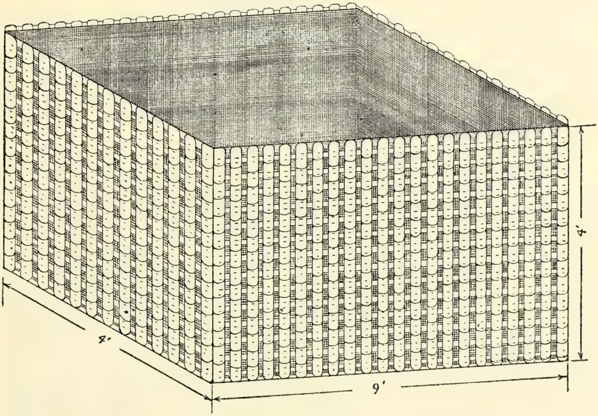
METHODS OF HATCHING

After sufficient quantity of eggs are collected from the river, these are transferred to the mud-enclosures in the boats and from the latter to the nets covering hapas, which are previously filled with water. For want of nets the same curtains are used for the collection as well as for hatching ova. The net on each hapa is allowed to sag about 6 inches below the surface of water while the rope lacing its margins is fixed to pegs on the banks at short distances, so that a bag-like hollow or depression is formed in the hapa. Below the bag a few strong bamboos are placed parallel to each other, along the breadth of the hapa. These bamboos are carefully rolled from time to time with a view to disturbing the eggs so that the ova may come to the surface. One hapa accommodates from 4 to 10 buckets (a bucket=15 seers) of eggs, numbering 9,00,000 to 22,00,000. These eggs lie in several layers so that the lower layers are pressed hard. These ova are carefully and constantly moved by twigs so that the ova may get equal chance of development. The spawn when collected is a mixture of prawns, insect larvae, small fishes, etc. These useless creatures are not separated from the fish ova before transferring the latter to hapas. These animals move about actively in this confinement and injure the ova and some of them even devour them. Some of these also die in captivity and by their decomposition fungus makes its appearance and attacks the ova. There is no regular aeration of water in the hapa.

The ova remain on the nets and the water of the hapas is not changed till the larvae hatch out and pass through the meshes of the nets into the water of the hapas below as free individuals. This may take about 24 hours or more for all the larvae to come out of the egg-membranes. When, however, most of the larvae hatch out, the nets with egg-shells, dead and decomposed eggs, dead and alive insect larvae, prawns and fish are removed and washed in the river. The fish larvae on the other hand remain in the water of the hapa till the second day, when these are collected with the help of closely woven sheet of cloth and introduced into another hapa containing fresh water. This procedure is repeated for a week or so. If instead of transferring larvae from one hapa to another a continuous current of water can be set up, the hatching percentage can be increased manifold. At some of the places there was no difficulty whatsoever in preparing such hapas.

During bright sunny days, the ova in the hapas are protected from the sun by placing on the hapas bamboo, covered by matting.

There is another method, which is used for the embryonic development only. Big bamboo baskets of various sizes and shapes are used for this purpose. These are lined internally with fine cloth and in the containers thus formed the ova collected from the stream are transferred. These baskets are locally known as 'Chang' (text-fig. 4). These are moored in the stream.



Text-fig. 4

The embryos are allowed to develop here for some hours but are transferred to hapas before hatching takes place. The fry obtained by this process are supposed to be more healthy than those obtained as a result of entire development taking place in the hapas.

In the case of persons, who cannot afford to hire boats, ova are collected in another way. One of the shorter ends of the net in this case is tied to a pole fixed in the river while the opposite margin is held by a person standing near the bank. Thus sufficient quantity of ova are collected by these persons.

Results of some experiments

Some experiments were conducted on a small scale to determine the best method to get larger percentage of hatching. These experiments were not conclusive but at least it has become clear that careless handling of ova, crowding them on mosquito net, etc. and want of proper aeration are harmful and destructive to the proper development of eggs and larvae. The experiments are in progress, and the details will be published as soon as conclusive results are obtained.

COMPARISONS WITH METHODS EMPLOYED IN OTHER PLACES

From the river Halda (see map, text-fig. 2), and the bunds at Midnapore (Mookerjee, Mazumdar and Dasgupta 1944) the ova are collected with the help of mosquito curtain, which is bigger in Chittagong (from 36-39×9 feet) than in Midnapore (7½×3 feet). In the case of Bankura (Jamda Bundh), which was inspected in the month of July 1947, fine cloth 6×3 feet was used instead. The mosquito net cloth, however, gives better results because only the ova remain in the net while the water finds its way out, whereas in the case of fine cloth, it is often difficult to get rid of water and even at the time of collection the cloth interferes with the normal working. In a bundh at Chittagong (Majumdar, 1940 p. 737), the ova are not at all collected but are allowed to develop in the bundh itself.

Like the collecting nets, the hapas also differ in dimensions. In Chittagong the average dimensions were 16×8×1½ feet, in Midnapore, these were 4½×3×1½ feet while the dimensions were found to be only 3×2½×1 feet in Bankura. In none of these instances, however, there was any arrangement for setting up current of water in the hapas.

In Chittagong the *hapas* are covered by the mosquito curtains, which sag in water, and on this the ova are transferred. On the other hand, the ova are transferred directly into the *hapas* in the districts of Midnapore and Bankura. The first arrangement has some advantages over the second. Firstly, the ova can be orientated in such a way that most of them come to the surface. Secondly, after hatching, the larvae pass through the meshes of the curtain while the egg-membranes, dead eggs and other animals remain on the curtain and can be removed.

The number of ova put in one *hapa* greatly differs in the three localities. In Chittagong about 9 to 22 lakhs ova are put in one *hapa* whereas in Midnapore about 12,000 and in Bankura about 55,000 are treated in one *hapa*. If we take 5 mm. as the average diameter of an egg, about 4½ lakh ova can easily be spread in a single layer in a *hapa* at Chittagong, about fifty thousand in Midnapore and about twenty-seven thousand in Bankura.

Majumdar (1940) and Mookerjee, Mazumdar and Dasgupta (1944) have stressed the necessity of aerating *hapas* for better results. The results of the experiments conducted at Chittagong and Bankura support this view. The observations of Majumdar that ova are overcrowded in *hapas* in Chittagong were mostly found to be correct but the suggestion of Mookerjee, Mazumdar and Dasgupta that to avoid overcrowding only a cupful of eggs (about 1500) should be kept in each hapa, does not seem practicable in view of the large number of ova to be treated. Fifteen hundred ova will occupy only about 1/33 part of the space, if ova are arranged in one layer and so if their recommendation is followed the rest of the space will remain unused. In trout hatcheries at Katrain (Punjab), Harwan and Achhabal (Kashmir) and Avalanche (Madras), the ova are arranged in a single layer and all the space in the trays is properly utilised. The same practice can be followed in the present case with success.

Mookerjee, Mazumdar and Dasgupta have recommended the use of two sheets of cloth to keep the eggs in the pits, one piece to be spread on the top of the other, with a space in between the two. In order to keep the sheet of cloth in place, they have recommended the use of weights in the centre.

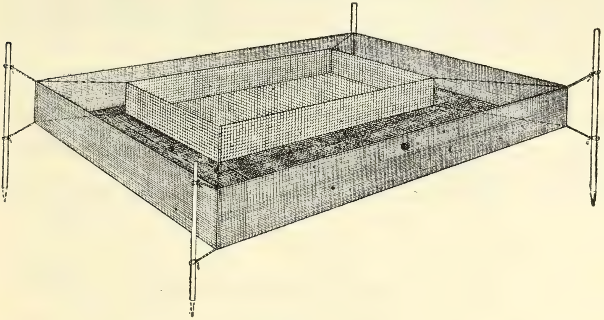
This is a useful suggestion but can further be improved. In the present case due to the weight in the centre, all ova will gather together in the bag-like structure formed in the centre and this overcrowding is harmful for the development of ova. The net can be made into a rectangular tank (text-fig. 5) like an inverted mosquito curtain, and all the four corners of the inner tank can be tied to the corresponding corners of the outer tank and the corners of the latter can be fastened to four upright poles of bamboo fixed for the purpose, so that both the tanks remain properly stretched and no bag-like structure is formed. When the ova are transferred to such improvised tanks, these will mostly remain in their proper positions and there will be no overcrowding at any one spot.

Mookerjee, Mazumdar and Dasgupta have recommended the use of plants such as *Ceratophyllum* and *Hydrilla* for promoting natural aeration in hapas. These plants will not be useful for two reasons:—

(1) In netting larvae they cause obstruction; and

(2) At night and on cloudy days these will reduce oxygen through respiration.

The principle followed in the case of trout hatcheries after suitable modifications will probably be the best course to follow in the present case.



Text-fig. 5.

SUGGESTIONS FOR IMPROVEMENTS

(1) *Handis* or pucca earthen vessels should be used in place of mud-enclosures in the boats for usually a lot of mud dissolves in water, rendering the water muddy and injurious for the development of ova and larvae.

(2) Ova collected from the stream should be transferred to *hapas* after short intervals instead of piling them for a long time in mud-enclosures in the boats. By this procedure more oxygenated water and space can be provided for the development of the ova.

(3) The ova should be separated as far as possible, from debris and animals before transferring them to *hapas*.

(4) The ova in the net should not be piled in heaps but should be arranged in a layer. It was seen that in one of the *hapas*, where about 60 lakh ova were placed, the owner could get only about 2 lakh larvae while from a *hapa* of the same dimensions and under similar conditions containing about 8 lakh ova, the larvae obtained were more than two lakhs.

(5) Continuous current of water from the river should be set up in the *hapa*, wherever possible.

(6) Below the mosquito netting a sheet of fine cloth should be placed in the *hapa*, as shown in figure 5. By this method all the larvae can be collected in the lower sheet and labour of collecting them from the *hapa* will be saved. Moreover, the larvae which cannot be gathered from the *hapa* and are lost to the collector, will also be saved.

(7) After the collection of ova is over, attempts should be made to collect larvae and fry from the stream. For the collection of larvae and fry the net known at Rajshahi and Murshidabad as '*Benchijal*' can be used. For the figure of this net reference may be made to Rahman (1946).

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Explanation of text-figures

Text-fig. 1.	Mosquito-curtain used in the river Halda, Chittagong, for collection of eggs.
Text-fig. 2.	Sketch map of a portion of the Halda showing spawn collection area.
Text-fig. 3.	A typical arrangement of *hapas* in Chittagong.
Text-fig. 4.	'*Chang*', used for embryonic development.
Text-fig. 5.	A double cloth tank, used for experiments in the Halda.

WILD LIFE PRESERVATION:

India's Vanishing Asset

BY

Lt.-Col. R. W. Burton

This contribution to the *Journal* of the Society was in course of preparation when there appeared in the ' Madras Mail ' newspaper of 6th January 1948 an article by Mr. D. Dorai Rajan under the caption, ' Preserve India's Wild Life—an appeal for Government action.'

It is well that the first ventilation of this urgently important subject in the public press since the 15th August 1947 should have been put forward by a national of the new India.

Mr. Rajan's plea deals with South India only, so a similar plea with regard to both the dominions into which this sub-continent has been recently divided is now placed before the members of the Bombay Natural History Society—which has been for many years in actual fact an All-India Society—and the readers of the Journal, and through them to the public at large, the Governments of India and of Pakistan ; all the Provincial Governments and rulers of States, and all owners of land.

The Bombay Natural History Society

For many years the Society, through the medium of its Journal and other attractive publications, has endeavoured to create and stimulate in India an interest in the wild life of the country. During the past sixty years there have appeared in the Journal upwards of fifty longer and shorter articles and editorials on the subject. It was to a great extent owing to the Society that Act XX of 1887, ' An Act for the Preservation of Wild Birds and Game' (passed after nearly 30 years' agitation in the matter), was replaced by ' The Wild Birds and Animals Protection Act (VIII of 1912) which, together with the Indian Forest Act (XIV of 1927) is the basis of all rules in force at the present time.

PRINCIPLES

In all civilized countries there is a general recognition of the need for concerted and practical measures to stop the forces of destruction which threaten wild life in all parts of the world. The principle is the same everywhere, the methods to be employed must vary in every country, and will also vary in different parts of the same country. That has special application to India as a whole, and is the reason why legislation on wild life in this country has been complex and difficult.

'Until it is recognized that Wild Life is a valuable natural resource, and the benefits derived from an unguarded resource are wasting benefits, waste will continue until the resource has gone and the benefits have vanished. No natural resource is more sensitive to conservation than Wild Life, and no natural resource has suffered more from lack of conservation. During the last sixty years species have been exterminated due to this deficiency.' (Hubback).

At the present time the pace and extent of the waste is alarming. In this country there is the gravest need for concerted action.

'In its fauna and flora nature has endowed India with a magnificent asset. A further interest attaches to our wild life from its association with the folk-lore and legendary beliefs of the country. It is an interest not confined to India alone, but which has spread among men of culture everywhere because of the esteem and admiration in which her sacred books and writings are held.' (Prater).

BIRDS

Although birds are not now persecuted to the same extent as animals, yet an enormous amount of unnecessary and preventible damage is going on. One bright spot in India, as Champion has remarked, is that non-game birds are not harried to the same extent as used to be the case in some western countries, for the Indian boy does not amuse himself by uselessly collecting vast numbers of birds' eggs. But India had the dreadful plumage trade, which was far worse.

The Great Indian Bustard is becoming increasingly scarce and has gone from areas where it was common not many years ago. The Monal Pheasant and the Tragopan of the Himalayas have been saved only through prohibition of export of plumage. Other birds saved from what would have practically become extermination through the extremely lucrative plumage trade were peacocks and black patridges, egrets, jungle-cocks, paddy-birds, kingfishers, jays and rollers, orioles and a host of others. The governments controlling Pondicherry, Goa and other ports on the coasts of India co-operated, so the traffic was stopped. But there were many subsequent cases of smuggling, and these will certainly recur if the plumage trade measures are ever relaxed.

All interested in bird life should take warning through perusal of Mr. Dodsworth's illuminating article. (17)

Now that Burma is separated from India it behoves the governments through their Customs Departments to be increasingly vigilant, not only at all the ports but through the post offices and along the land frontiers also.

NOMADIC TRIBES

In all tracts where the snaring and netting of ground game is the hereditary occupation of various nomadic tribes partridges, quail, florican, hares are fast disappearing. These people, expert in their calling for untold generations, sweep the country as a broom sweeps the floor; nothing is passed over, nothing is spared.

The time has long past when snarers of indigenous game birds should be allowed to continue to earn a livelihood in that way; in any case all markets should be denied them, and public opinion should recognize that flesh of such wild creatures is not in these days at all necessary for human existence and should ban the killing of them for food alone. Properly regulated sport may be allowed during the seasons prescribed by local governments in respect of each species.

Within a considerable distance also of Calcutta, Bombay, Madras and other large places markets are supplied in season and out of season through other agencies and local 'shikaris' in spite of the local government close season rules under Act VIII of 1912.

Even if legislation on lines suggested in this article is effected, however much it can and may help in the endeavour to protect wild life, anything like *practical* success is possible only if there is a strong Public Opinion co-operating with the governments. That cannot be too often reiterated.

Value of Birds.

In connexion with all that is written above the thought-provoking article, 'Bird Protection in India: Why it is necessary and How it should be controlled,' by Sálim A. Ali, M.B.O.U., contributed in 1933 to the U.P. Association should be read by all governing bodies. Indeed it is most essential to national India that bird life should be adequately conserved. For 'Quite apart from a sentimental value, birds render incalculable service to man. Without their protection our crops, our orchards, our food supply would be devoured by hordes of ravaging insects. Birds are the principal agency that controls the bewildering multiplication of insect life which, if unchecked, would overwhelm all life on this planet.' (Prater).

SPECIES IN DANGER

Mammals: The Great One-horned Rhinoceros has only been saved by special measures and these, if in any way relaxed, will inevitably lead to its extinction. A close relative to the above the Lesser One-horned Rhinoceros (*sondaicus*), which has been within the memory of many an inhabitant of the Sunderbans jungles and other tracts, has completely disappeared—none now exist on the soil of India. The Asiatic Two-horned Rhinoceros which occurred in parts of Assam has gone from there for ever, and both these species are approaching the vanishing point in Burma and other countries where they were formerly in fair number. In Burma the Thamin Deer is probably doomed to extinction.

In Western Pakistan and neighbouring mountains the Straight-horned Markhor is rapidly disappearing; and if the Punjab Urial is not carefully preserved that species will not long survive.

The Indian Antelope (Black Buck) is becoming increasingly scarce and will eventually only be preserved through protection; to a less extent the same can be said of the Indian Gazelle. The Cheetah or Hunting Leopard, was not uncommon in the central parts of the peninsula but is now practically extinct in a wild state. The Wild Buffalo has almost gone from the areas east of the Godavari river where it was common not long ago; and it needs continued protection in Assam. The Asiatic Lion in India has only survived in its last stronghold through protection in the Gir Forest of the Junagadh State in Kathiawar.

' In many districts the larger animals have been totally wiped out. In others, where they were once common, they are now hopelessly depleted. There are a few parts of India where the position of wild life is to some extent satisfactory, though insecure. Equally there are extensive areas where conditions are so appalling that, if left unchecked, they must lead to the complete destruction of all the larger wild creatures which live in them. ' (Prater.)

Year in year out there is terrible destruction throughout the enormous tract of mostly hilly and forested country comprising the Eastern States, from the Godavari river as far as Bengal, some of which are being now merged into India. The methods of the aboriginal tribes inhabiting this huge area (and other parts of India also) are those of extinction, for they net, snare, shoot all edible living creatures at all possible seasons and particularly during the hot weather months when water at the few pools is a necessity to all and renders them an easy prey.

In the Himalayan mountains also where control is difficult wild animals are definitely decreasing, and only to be found in any number in the more inaccessible places.

TIME FOR DECISION

The Governments have to decide without delay if wild life is to be effectually preserved or the present lamentable state of affairs allowed to continue. In the latter event there can be but one result—the total and irreplaceable extinction of some forms of wild life, with everywhere woeful reduction in number of all wild animals and many species of birds.

There is no middle course. Half measures will be futile and waste of time. Wild life is a national and natural asset which, if it is ever lost, can never be replaced. It is necessary that governments should give a lead, a strong and unambiguous lead.

India and Pakistan should be proud to stand side by side with other civilized countries of the world in saving their fauna from extinction.

In these days public opinion should recognize that flesh of wild animals is not necessary to human existence; but public opinion may not eventuate for many a long day. Meat-eaters want something for nothing and care not how they get it. Posterity means nothing to them.

One instance. In November 1947 six shot carcasses of chital hinds were found with a man in a country bazaar in a British district. Police said prosecution doubtful because no evidence as to where the animals were killed. But a so-called ' Sanctuary ' was not far distant. Burden of proof should be on the possessor. In any case Rules under Act VIII of 1912 must have been contravened and conviction could have been had.

Legislation, and that very speedily, should absolutely prohibit offering for sale, possession for sale, or marketing in any way the hides, horns, flesh or any other part of any indigenous wild animal throughout the year. And, as was done by Notification in 1902 to suppress the plumage trade, so also should the trade in products of wild animals be stopped by prohibition of export by sea, and by land now that Burma is independent of India.

It would appear that there is no possible objection on religious or other grounds to a general law throughout the whole country to the above effect. Profits are large and really deterrent sentences would be necessary.

Public Opinion

At the present time public opinion as to wild life preservation is almost non-existent in this country. It is only through public opinion that wild life can be saved and preserved through all the future years.

Hear a great statesman of former days in another land :—

> ' In proportion as the structure of a Government gives force to public opinion, it is essential that public opinion should be enlightened.' (George Washington)

In these days that is done through the many avenues of propaganda.

Propaganda

Political parties in this country have been able to rapidly rouse and educate public opinion in all kinds of political matters. Is it not therefore possible that through like efforts the thoughts of the people can be directed towards the necessity of the conservation of this national asset of wild life ? It *can* be done. Great are the powers of propaganda.

Let the secular and religious leaders of the people lend their great influence and abundant powers of persuasion to furtherance of this most pressing need. Where there are religious influences at work wild life is sacrosanct. All of us know that. We see it everywhere : peafowl, parrots, pigeons, monkeys, nilgai and other species—fish in sacred river pools. Even where some of these creatures cause much loss and damage to growing crops and to gathered grain they are protected through religion.

Where the rulers of States have made their wishes known and enforced, wonderful are the results. Instances are known to those having this subject at heart ; a number are known to the writer.

ENEMIES TO WILD LIFE PRESERVATION :

FORGETFULNESS—INDIFFERENCE—IGNORANCE—GREED FOR GAIN

Laws are enacted, rules are made and forgotten, for there is no continuity of official enforcement and no public opinion to keep them in mind.

India

Within not many years Act VIII of 1912 was forgotten, the wide scope of its provisions unknown. The rules under the Act were ignored and its provisions a dead letter.

1933. ' The Governor in Council has reason to believe that there has been little improvement in the administration of this Act and that subordinate officials are, not infrequently, offenders against its provisions, × × × × it is believed that sheer ignorance of close seasons is in many cases the cause of offences against the Act'.....

Ceylon

Notwithstanding a much interested and powerful Game and Fauna Protection Society, the many difficulties of which are related in Vol. 35, pp. 666 et seq, it has not been possible to effectually preserve wild life. The Annual Report for the 54th Season states:— ' Poaching is undoubtedly on the increase, and in some areas wholesale destruction goes on. ' And that is after 54 years of endeavour to save the fauna of the island for posterity!

How could it be otherwise ? In 1907 the reply of the Ceylon Government to urgent representations of the Society for effective action elicited the reply, ' Our Game Laws are quite efficient, but we regret we have not the power to enforce them. ' It would seem that the same answer would have to be given to-day.

Up to now the position in India has been similar to that. ' The laws and rules are well framed but are not sufficiently enforced, ' (Editors). It cannot be too often asserted, ' Existing laws and rules are excellent in themselves but it is in the efficient application of them the trouble arises. ' (Editors)

Guns and Greed

Apart from genuine sportsmen, it is the possessors of guns and rifles who do the greatest amount of harm. In many cases it is not the actual licensee who does the damage, but the illegal habit of lending or hiring out the weapon to others. Could the abuse of license granted as a personal privilege be stopped much good would result. But how is this to be done? Only through public opinion could it be effectually curtailed. So what ? Suggestions as to Arms Act, if carried out, would do some good.

It is as a poacher that man is the great destroyer; and the main incentive is profit by selling hides, horns, meat—to a less degree, is it meat only. In some places local dealers finance the village shikari, providing him with guns and ammunition in exchange for hides, etc. Sambar and chital hides and heads are openly bought and sold in many bazaars and there is nothing to prevent it. Sale of trophies is common in many large towns and cities. To deprive sellers of their markets by effectively enforced legislation and through public opinion is the only way to remove temptation to kill for profit. If there were no buyers there could be no sellers. Utopia !

CROP PROTECTION

It has always been pointed out, and is notorious, that crop protection and other weapons are used for the slaughter of game animals in adjacent and further forests regardless of all laws, rules, age, sex, season, or any other consideration whatever than profit. All this and other poaching is mostly carried on in Government forests, for there are to be found more animals than outside them.

So far as crop protection goes the argument in the mind of the cultivator is that if there are no animals the crops will not be eaten, so he may as well hasten the coming of the welcome day and meanwhile make money for himself and provide meat to the community.

Guns :

The great increase over former years in the number of licenced guns is producing its inevitable adverse effect; and there is the mass of unlicenced weapons carefully concealed and constantly used. While the reduction in the number of weapons is admittedly a difficult matter—the withdrawal of crop protection guns during the seasons when the crops are off the ground and the guns not needed for legitimate use is a reasonable proposition. That would be of much benefit as those are the months in which they do the most harm.

A suggestion from Assam was that crop protection guns now owned by villagers (more especially those inside Government forests) might be acquired by Government for temporary issue at the right time and withdrawal when no crops, or for other reason.

It is not likely, however, that Provincial Governments would adopt these gun withdrawal suggestions on account of practical difficulties and extra work to District Magistrates and other officials.

A proposal advocated by many is that crop-protection weapons should be licenced for cut-short barrels only. Cogent arguments against such modified weapons are that they are more liable to be loaded with buckshot, so causing many animals to be wounded and lost ; are dangerous in hands of such persons as ordinary cultivators ; and such restriction would cause an increase of concealed weapons for poaching.

It has been demonstrated in South India by Colonel R. C. Morris that bamboo-tube rocket-firing ' guns ' are both cheap and effective for scaring crop-raiding wild elephants, so firearms need not be used against them by cultivators.

Such ' guns ' could also be effectually used in many forest areas against other crop-raiding animals and so enable a large reduction in the number of guns now licenced for ostensible crop protection.

THE ARMS ACT

Some suggestions.

Firearms licences are issued for :—

(1) *Sport.* These should be breech-loaders, and in case of rifles may be magazine weapons. Automatic weapons and muzzle-

loaders should not be licensed for sport. The former lead to indiscriminate firing, the latter to cruelty through use of buckshot, bits of iron, old nails &c.

(2) *Crop and cattle protection.* These should be smoothbore guns only; and being by law available at holder's residence only, due care on part of licensing officer can limit use of the weapon to *within village boundaries only.* These are surveyed and marked in forest maps so above entry would have effect of a conviction where otherwise a loophole might exist. Perusal of an annotated edition of Arms Act and Rules is illuminating as to number of avenues for escape of the wrong-doer under all categories.

(3) *Personal protection.* The only weapons allowed, unless the license is for sport also, should be revolver or pistol. A rifle or shotgun is easily robbed and just as easily turned against the possessor.

(4) *Display.* This meaning ' show with ostentation ' such weapons only as are non-lethal should be licensed for this purpose.

In all cases license should be plainly crossed with words ' Sport only ' or ' Personal protection only ' etc., as the case may be.

Licenses for possession of smoothbore guns are ordinarily issued on application and without previous enquiry. Other licenses are issued to persons of approved character and status, this latter being as may be prescribed by the Local Government.

Were the foregoing suggestions adopted there would be no real hardship to anyone, and wild life might greatly benefit.

AGRICULTURE AND WILD LIFE

For purposes of wild life conservation lands may be classified in five main categories:—*Urban—Agricultural—Waste—Private—Forest.*

Urban Lands.

In these, measures should be taken for the protection of all birds. Areas actually under the control of municipalities or local boards could with advantage be constituted bird sanctuaries where the killing of, or taking the eggs of, any wild bird should be forbidden. The necessary machinery is at hand in Act VIII of 1912, relevant sections of which are here given for use with this and other parts of this contribution.

Whereas it is expedient . . . .

1. (1) This Act may be called the Wild Birds and Animals Protection Act 1912; and
   (2) It extends to the whole of British India, including British Baluchistan, the Sonthal Parganas and the Pargana of Spiti.
2. (1) This Act applies, in the first instance, to the birds and animals specified in the Schedule when in their wild state.
   (2) The Local Government may, by notification in the local official *Gazette*, apply the provisions of this Act to any kind of wild bird or animal other than those specified in the Schedule which, in its opinion, it is desirable to protect or preserve.

3. The Local Government may, by a notification in the local official *Gazette*, declare the whole year or any part thereof to be a close time throughout the whole or any part of its territories for any kind of wild bird or animal to which this Act applies, or for female or immature wild birds or animals of such kind; and subject to the provisions hereinafter contained, during such close time, and within the areas specified in such notification, it shall be unlawful

- (*a*) to capture any such bird or animal, or to kill any such bird or animal which has not been captured before the commencement of such close time;
- (*b*) to sell or buy, or offer to sell or buy, or to possess any such bird or animal which has been captured or killed during such close time, or the flesh thereof;
- (*c*) if any plumage has been taken from such bird captured or killed during such close time, to sell or buy or to offer to sell or buy, or to possess such plumage.

4, 5, 6, 7. Penal and other provisions.

8. Nothing in this Act shall be deemed to apply to the capture or killing of a wild animal by any person in defence of himself or any other person, or to the capture or killing of any wild bird or animal in *bona fide* defence of property.

9. Repeals Act XX of 1887.

The Schedule

- (1) Bustards, ducks, floricans, jungle fowl, partridges, peafowl, pheasants, pigeons, quail, sandgrouse, painted snipe, spurfowl, woodcock, herons, egrets, rollers and kingfishers.
- (2) Antelopes, asses, bison, buffaloes, deer, gazelles, goats, hares, oxen, rhinoceros and sheep.

In 1915 (vol. 24 p. 382) it was pointed out that the practice of taking the eggs of sitting pheasants and partridges is becoming increasingly common and to this malpractice the Act provides no safeguard. That suggestion has not been followed. To the above may now be added that it is a common practice to rob for food the eggs of indigenous wildfowl—the Spot-bill Duck and the Cotton Teal.

The suggested amendment to section 3 was addition of a clause regarding eggs and nests. This suggestion is now again brought to notice as desirable.

'To take or possess, to sell or buy, or offer to sell or buy, an egg or eggs or nest of any such bird'.

Agricultural Lands.

Here lies the clash between the interests of Man and Animal; for which there are two main reasons.

Firstly, the population of the country is increasing by about five millions yearly, so the areas under cultivation are extending, and must continually extend to the utmost limit, which means the continual absorption of all cultivable waste lands and secondary forest lands.

Secondly there is the imperative need of protecting present and future cultivated lands from wild animals.

In some parts, where cultivation is contiguous to or near Reserved forests the depredations of wild animals present one of the most serious handicaps the cultivator has to face. The animals are not only deer and pig and some species of birds, but nilgai, monkeys and parrots which are protected by religious beliefs.

'Human progress must continue, and in the clash of interests between Man and the Animals human effort must not suffer. But this problem has been faced by other countries. Cannot a reasonable effort be made to face it in our own ? That an intensive development of the agricultural resources of a country may accompany a sane and adequate policy for the conservation of its wild life is shown by the measures taken to this end by all progressive countries.' (Prater)

But in those countries there is universal literacy, a people easily educated to a proper public opinion, and where the masses do not clamour for possession of guns and rifles and even for repeal of the Arms Act.

Waste Lands.

These are beyond redemption as to wild life, and in any case all that are at all cultivable will soon be merged with Agricultural lands.

Private Lands.

The general concensus of opinion is that in most ordinary tracts the position is hopeless. The people have been educated to destroy, and there is no agency to stop it. Only through the owners themselves and through propaganda can any change be wrought: and before these operate the position is likely to be beyond any remedy.

Some private lands, however, have forests for which rules have been framed to regulate hunting and shooting, while in others no rules have been framed. The wild life situation in all these depends on the amount of control exercised by the landowners. Some United Provinces landowners maintain renowned Swamp Deer preserves.

The Wild Birds and Animals Protection Act, 1912, deals with the right of private owners only in so far as it prohibits the shooting of the specified animals whether on private lands or elsewhere. This prohibits private owners killing females of deer, etc., and killing during prescribed close seasons.

Government Forests.

These are of several kinds and mostly under the Forest Department, but some are under Revenue Department; none of the latter are Reserved Forests.

While it is essential that the cultivator should have reasonable latitude to defend his property, it is equally essential that there should be certain areas of Reserved Forests, where the laws and rules for protection of wild life are, or should be, rigidly enforced.

State-owned Reserved Forests, similar forests in the Indian states in the Terai tracts of the frontier states of Nepal, Sikkim, Bhutan and some private forests are now, and must continue in future to remain the natural sanctuaries for wild life in this country.

That purpose they would adequately fulfil as regards most of the species in the Schedule were they *adequately guarded.* That is the crux of the whole problem. And with that is linked the proper enforcement of the relevant laws and rules governing the possession and use of firearms and the control of legitimate sport.

Legitimate Sport

Shooting rules and license conditions for Reserved Forests as at present framed for the several provinces and districts, also for some of the larger states, are good and well adapted to local conditions. They provide against all conditions, all malpractices, including the motor vehicle and use of torch against deer.

Licence fees are on the whole rather cheap; and where the Shooting Block system does not obtain, and District or Forest Division licenses are issued for a whole year on payment of a very small fee, the introduction of the Block System would cause a larger number of sportsmen to visit the forests. This is productive of much good, for when right-thinking sportsmen are in the forests, poaching is held in check for the time being ; and the sportsman can (or should) report such malpractices as come to his notice.

The short term license system also enables the controlling officer to regulate the number of species, whether deer, etc. or carnivora, for each block in his Division. Such control preserves the balance of Nature and aids efficient protection.

Where a change is necessary is the adoption everywhere of the Assam arrangement by which the sportsman has to pay a fixed royalty for each animal shot by him under his license. The system makes sportsmen more careful as to animals they shoot at, and aids needed funds for a Wild Life Department.

Wild Life and/or Game Associations

Where these exist they are, if well organized and conducted, wholly productive of good. There is the Association for the Preservation of Game in the United Provinces through which the All-India Conference for the Protection of Wild Life was held at Delhi in January 1935 and the Hailey National Park established in the Kalagarh Forest Division. At the Conference it was declared that, " Indian Wild Life could only be saved by Public Opinion, and that legislation, however efficient, could do little in matters like these without the whole-hearted support of the Public." How true. Where is the Public Opinion ? Where is the support of the public ? What is the state of wild life at this thirteen years later date ?

In Northern Bengal are three shooting and fishing associations :—

(1) Darjeeling Fishing and Shooting Association.
(2) Tista-Torsa Game and Fishing Association.
(3) Torsa-Sankor Game and Fishing Association.

In Madras is the 69 years old Nilgiri Game Association but for which little wild life would now exist in that district. Continuity of purpose, efficient control.

In 1933 an Association for the Preservation of Wild Life in South India was inaugurated at Madras by the then Governor of the

Presidency, but it came to nothing and has never been heard of since then. Continuity of Purpose—Public Opinion these basic essentials do not exist. Without them there can be no effectual preservation of wild life for posterity.

NATURAL ENEMIES OF WILD LIFE

Tigers. Where in forest areas deer have been excessively reduced in number through poaching the tiger turns increased attention to cattle killing. The tiger needs the pursuit of deer to satisfy his hunting instincts, and where the balance of nature in this respect is not unduly disturbed he is of benefit, as also the panther, to the cultivator of land within the forests and along its borders, for he keeps the deer and wild pig population within natural limits. But where the stock of deer is unduly reduced not only are all the deer killed out but the tiger is forced to prey on cattle ; and as these are penned at night he is compelled to change his habits and hunt by day. That is when he takes great toll of grazing cattle and sometimes turns against the people also. Then the cultivators clamour for protection from the menace brought about by the unlawful poaching done by themselves and others.

Panthers. These are less destructive to village cattle as they prey on sounders of pig and a variety of smaller animals ordinarily ignored by the tiger; but they also kill cattle and other domestic stock to a greater extent when the balance of nature has been disturbed. In areas where panthers have been unduly reduced through rewards for their destruction there has resulted such an increase of wild pig as to necessitate rewards to reduce their number.

Even predatory animals (not wild dogs) have a distinct value as a controlling influence against over-population by species whose unrestricted increase would adversely affect the interests of man.

The balance of nature cannot be unduly disturbed with impunity.

Wild Dogs. These are wholly destructive of game animals and can be given no mercy. Rewards should not exceed Rs 15/- for a larger sum induces frauds of several kinds. Disbursing officers should have by them skins and skulls by which to check those produced ; and skins for reward must have tails and skulls attached and these be effectively destroyed when reward paid.

Best methods for reducing wild dog population are through digging out breeding lairs, and strychnine poisoning of carcasses by instructed persons.

Crocodiles. In the jungles of India the crocodile is not the menace to human life that he is in Borneo, Sumatra, etc., and Africa. But where there are dry-season jungle pools in reserved and other forests crocodiles do an enormous amount of damage to all creatures, deer especially, which are forced to drink at those places.

It should be the duty of the Wild Life Department to destroy as many of them as possible. Visiting sportsmen should also give help in the matter.

UNNATURAL ENEMIES

Cattle diseases. A great cause of much periodical mortality to buffalo and bison is through rinderpest. Against the introduction of this by grazing cattle effective action has been found impossible.

CROP ENEMIES

Elephants. Effective legislation was enacted in 1873 and 1879 to protect the elephant. In these days of mechanical haulage the preservation of these animals is not necessary in such large number as formerly. In some areas it is now very definitely necessary that regulated thinning out of herds and crop protection methods be initiated to protect landowners and cultivators from the great damage they suffer. This should be done by the suggested Wild Life Department on systems to meet local conditions.

There is also the need to have proclaimed rogues speedily dealt with. In most cases these animals have become dangerous because cultivators wound them by use of inadequate weapons. Local sportsmen may or may not be available to quickly deal with these beasts with consequence of further delay and more loss of life and property.

Where elephants have to be thinned out or killed the Wild Life Department's specially recruited and trained set of men—6 to 8 for each Province needing them—armed with Government rifles and controlled by the Provincial Warden can be directed to the area. They would also deal with proclaimed carnivora.

It can be anticipated that the demand for elephants in India will before long be reduced to the few needed for timber extraction in difficult areas, for riding and transport duties by the Forest and Wild Life Departments, for ceremonial purposes, for ivory, and for zoological purposes.

Therefore it can be reasonably said that elephant herds in some areas—Southern Circle, Bombay, North Coimbatore, Kollegal and the Wynaad for instance—could be reduced to a minimum; and herds in parts of Bengal, Assam, Orissa, in places where they may be greatly oppressing the cultivators could be also thinned out.

These suggested operations would not in any way endanger the continuance of the species.

Wild Pigs. Deer and the like are crop raiders, but it is the wild pig which is the principal crop destroyer both in the open country, adjacent to the forests and within the forests. Where the balance of nature has not been disturbed the larger carnivores take care of the surplus pig population harbouring in the forests. It is not by the lone-working cultivator with his gun that any impression is made on the number of pig.

Some 25 years ago it was realized by the Bombay Government that damage to crops by wild pig amounted to crores of rupees. Measures to deal with the trouble outside reserved forests included clearance of cactus and thorn thickets and other such coverts together with organization of inter-village pig drives. Those measures will have had good results if continued as a fixed policy, but not otherwise.

At the time of writing (end of January 1948) the Government of India have been asked by the Government of the Central Provinces to supply arms and ammunition for use of cultivators against wild pig.

If the weapons are used against pig only, and at organized drives only, good may result, but if not so controlled they will assuredly be turned against the fast dwindling wild life.

NATIONAL PARKS

Those who have knowledge of the subject are of opinion that India is not yet ready for these. The Hailey National Park, the situation of which conforms in most respects to conditions laid down for a sanctuary (Smith) is specially situated and may be a success. A full account of it would be welcomed by members of the Society.

The Banjar Valley Reserved Forests area in the Central Provinces is perhaps suited for eventual status of a National Sanctuary (not Park). The case for it is outlined by Dunbar Brander. Buffalo, lost to it not many years ago could be re-introduced; otherwise it contains all the wild animals of the plains except elephant, lion, and gazelle. Elephants are not wanted as there are plenty in other provinces.

Even fifteen years ago the area was admittedly tremendously poached.

SANCTUARIES

All sportsmen are agreed that these are of little use unless adequately guarded and, as that has not yet been found possible in India, such areas merely become happy hunting grounds for poachers from far and near. The constant presence of sportsmen of the right kind has been found the best guarantee for preservation of wild life in Reserved Forests.

There are however, tracts and forests where wise forethought and administration can, with the willing co-operation of the people if that can be obtained, do much to preserve wild life for posterity.

Under the present re-organization of India a number of the smaller States, and many lands privately owned, within which wild life has had no regulated protection, will now be brought within the laws of the rest of the country to the benefit of wild life in all its aspects—if the laws are properly enforced.

The notable contributions on the Problem of Wild Life Preservation by Mr. S. H. Prater, the Society's Curator, on the 10th August 1933, and by forest officers for India, and Smith and Hubback for Burma are of the greatest value and recommended for careful study by all governments in this country.

A WILD LIFE DEPARTMENT

Forest Officers of the regime now ending have been of opinion that animals inside reserved forests should not be removed from the protection of the Forest Department and placed in the charge of a separate department. Their argument has been that the present system has worked well; such action would create resentment and alienate the all-important sympathy of the powerful Forest Department; and that a Game Department would be in no better case than the Forest Department for dealing with breaches of laws and rules.

On the other hand sportsmen and others with many years of experience are of opinion that under the present changed conditions forest officers, while not relieved of all responsibility, should be relieved of their present whole-time onus and share the burden of preservation of wild life with a specially organized Wild Life Department.

Why should not the two departments work amicably in liaison? There need be no friction. The appointment of Honorary Wardens has not always proved a success, not on account of any disagreements but because the conservation of wild life is a whole time duty which no man with other interests and work to do can efficiently perform. There could be Honorary Wardens to assist the Government Wardens and enthusiasts could be found for that work.

It has not been that all forest officers have been keen on the preservation of the larger game animals; some sylviculturists have expressed definite opinions against any deer being allowed in the forests, but movable fencing has been found a sufficient protection to special plantations.

In these days of intensive exploitation of timber and forest produce the work of forest administration has become more and more exacting and the officers find it exceedingly difficult to give time in office and out of doors to work which brings in no revenue and is considered of subsidiary importance.

Would not Forest Officers welcome the considerable measure of relief which the formation of a Wild Life Department would afford them? Surely they would. Neither their pay nor their prestige would be in any way affected.

It has been experienced that an unbribable staff of Game Watchers has been difficult to procure. That again is strong reason why there should be whole time Wardens whose interest would be to prevent malpractices.

A Wild Life Department means that continuity of purpose without which all endeavour is of no avail.

Money and Funds. The whole question is a matter of money.

Wild Life cannot be effectually conserved without spending money on an organization for the purpose. It is necessary to recognize the fact that there is an intimate connection between the revenue derived from wild life resources and the amount of money that can be spent on conservation.

This is the basis on which the financial policy should be built, together with the recognition that *wild life is a national asset and it is the responsibility and duty of the State to preserve it.* Therefore the fund will need such State grants as may be necessary to make the department effective, more especially in the commencing years.

It should not be possible for funds to be cut off, reduced or abrogated by governments. The Wild Life Fund, as it might be termed, should not be within the control of any Finance Department, Central or Provincial. It should be established by law, kept apart from General Revenues, earmarked for conservation of wild life and protected from any possible raiding of it or interference by the Legislatures.

STAFF

It is useless to build up a staff knowing that its position is insecure and at the whim of some ephemeral office holder.

It would be for the Central Government to decide on the method of establishing the fund, its control, and other measures considered necessary in regard to it.

FUNDS

It is reasonably argued that the considerable revenue accruing to the government, both directly and indirectly, through existence of wild life in this country should be applied to the conservation of the resource or as this contribution has endeavoured to demonstrate, the resource will continue to dwindle and eventually vanish.

Suggested Receipts and Expenditure:—

Receipts.

1. Customs duties—import of sporting arms and ammunition.
2. Licence fees—dealing in sporting arms and ammunition.
3. Licence fees—inland transport of sporting arms and ammunition.
4. Licence fees—possession of sporting arms and renewal of same.
5. Licence fees—Crop-protection weapons.
6. Licence fees—shooting in Government Forests.
7. Licence fees—elephant catching in Government Forests.
8. Royalties on animals shot or wounded in Government Forests.
9. Fines for breaches of shooting rules in Government Forests.
10. Fines, costs, and sums received for compounding of offences against shooting rules.
11. Court fines for offences against wild life laws and/or rules.
12. Receipts on sales confiscated articles.
13. Sales of picked-up tusks, horns, and produce of animals destroyed by departmental Control Staff.
14. Sales of skins of carnivora on which rewards paid.
15. Sales of tusks not allowed to sportsmen in some cases.
16. Licence fees for fishing in Government Forest waters.
17. Any other items accruing, such as donations and/or subscriptions to Wild Life Fund, income on Films produced by the Department and other miscellaneous items.

Expenditure.

1. Salaries and allowances of officers.
2. Do. do. and clothing of staff.
3. Transport of officers and staff.
4. Building and maintenance of Offices.
5. Do. do. of living quarters officers and staff.
6. Purchase and maintenance of weapons and ammunition for animal control.
7. Rewards for destruction of carnivora and other pests.
8. Rewards to Forest Guards.
9. Payments to informers.
10. Court expenses.
11. Stationery and correspondence.
12. Contingencies.

13. Sinking Fund for leave, gratuities and pensions.
14. Improvement of scanty water supplies.

ORGANIZATION

Some suggestions.

The Central Game Fund to be maintained in the office of the Ministry for Agriculture. The Wild Life Department to be linked through the Ministry of Agriculture with the Provincial Agricultural and Forest Departments.

Each Province to have a Provincial Warden, and as many Deputy Wardens as found advisable or necessary. These Wardens to rank with Conservators and Deputy Conservators of Forests respectively, and Game Rangers and Guards with corresponding Forest Department ranks.

Should the idea of a Wild Life Department be considered a suitable committee could work out all details. Recruitment of staff would need to be through careful selection of applicants in all grades; and there would have to be deputation of some of the Provincial Wardens to America and other countries to acquire knowledge of principles, methods, and all useful details.

Propaganda. During the years 1932 to 1936 there was a good deal of wild life propaganda in the public press at the instance of the U.P. Association, also in South India, but all that quickly died down. Then came the war years and now the present difficult times. Wild life has greatly suffered.

Educative propaganda needs constant reminders and exhortations to the public. Only if the subject is frequently repeated will it gain a hearing.

It is commonly said that it will take years and years to arouse public opinion as to wild life. But we daily see what the present leaders of public opinion in this country can do in many ways vitally affecting the present and future lives of the masses, how speedily laws are enacted and far-reaching measures put into motion. There is, for instance, the vast organization for further education of the literates and the initiation of universal literacy for the masses. There seems to be no reason why wild life preservation could not also be given the highest priority. Some of the reforms could wait, not that they should, far from it, but the wild creatures cannot wait—and survive.

Wild life preservation does not only mean the protection of animals and birds, it means a fight against the destruction which is going on at an increasing pace—particularly against deer—and is not of Nature's ordering. It is simply asserting the right to live of the undomesticated animals and indigenous birds.

An atmosphere of mistrust and suspicion is all too common among uneducated people, so the beneficial intentions of measures towards wild life preservation are apt to be misconstrued unless the objects and reasons receive the widest publicity through Government channels, and the newspapers.

The years are passing; this great national asset is wasting away. It is the duty of every government to preserve it for posterity. The urge should come from the highest levels.

PROPAGANDA METHODS

The time is *now.*

The Ministry of Information and Broadcasting could make it a routine matter to keep this subject constantly before all classes of the people. Special talks could be given on All-India Radio, and other systems.

The Educational Department could cause all governing bodies and educational institutions to issue pamphlets, organize lectures, lantern slide talks, and issue of suitable leaflets to all colleges, schools primary schools. All this could be worked out on the lines of the anti-malarial campaign which was an India-wide effort. But it must be a continued effort.

For the literate classes there are the newspapers and other publications as media for propaganda ; and for all classes there is the cinema screen.

Suitable slogans could be devised and shown as a routine matter at commencement and during intervals of all cinema shows, accompanied twice a week by a short talk in regional languages.

In 1944 (14-1-44) the Natural History Society resolved that a popular Nature Magazine be published by the Society, and in 1947 (5-6-47) it was decided that simple natural history booklets be issued in the several languages. The magazine idea was held up during the war years but measures to give effect to both resolutions are now in progress.

Moral support of the Government is essential and financial aid a necessity.

A BRIEF FOR ACTION

1. A decision by the Governments.
2. Issue of a general law to prohibit sale, possession, marketing of meat, hides, horns, etc., of indigenous animals and of birds.
3. Enforcement of Arms Licence rules and conditions.
4. Enforcement of laws and rules under Act VIII of 1912 and Act XIV of 1927.
5. Formation of a Wild Life Department.
6. Propaganda.
7. Generally all possible steps towards saving wild life.

Through the continued efforts of their leaders the peoples of India were roused to political consciousness. Through their long sustained efforts they attained political freedom. Will the leaders and the people not now demonstrate to other civilized nations that they are equally capable of preserving wild life for posterity ? Surely they will. Because they should, and because it is demanded for the prestige of India.

* * *

It was the intention of the Society and the writer to submit this pamphlet to Mahatma Gandhi with appeal for his powerful advocacy. Alas! it was not so ordained.

Yet, in view of the late Mahatma's well known sympathy with all things created, it may surely be hoped that the peoples of India and of Pakistan will respond to this appeal in accordance with what would without doubt have been his wishes and his guidance for the preservation of wild life in this country.

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NOTES ON INDIAN BIRDS, I

THE RACES OF *ANTHUS HODGSON*

BY

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In the course of studying Indian collections made by Walter Koelz recently in the Central Provinces and United Provinces of India, and by myself in the Mishmi Hills of North-east Assam, I came upon a number of perplexing specimens of Hodgson's Tree-pipit. In order to attempt to gain some understanding of this difficult species I have assembled over one hundred specimens from the collections of the U.S. National Museum, the American Museum of Natural History, including Dr. Koelz' material, the Academy of Natural Sciences, the Museum of Comparative Zoology and the Peabody Museum of Yale University. I am most grateful to the authorities concerned for the loan of this material and to my friend Dr. Koelz for permission to examine his specimens.

HISTORY OF THE SPECIES

In whatever continent, pipits seem to rank among the more difficult of the species of birds for the systematist or student of distribution to understand. This Asian species is more diffiicult than most because its breeding biology is little understood, and the confusion attendant on the names assigned to the races is so widespread that it is well-nigh impossible to depend on the existing literature for guidance in identifying the breeding localities of the populations. The migration of this species is also little known and what facts there are seem difficult to piece together. In general it is possible to summarize to this extent :

(*a*) Breeding Cycle. *Anthus hodgsoni* appears to nest any time from late May at least until July. I have not been able to examine a single specimen from a breeding locality which has had breeding data on the label. However, various authors speak of nests and eggs during this period in areas ranging from the Indian Himalayas above 8,000 feet to farthest Siberia. Birds are on the move both shortly before and immediately after the nesting season.

(*b*) Migration. Available evidence seems to indicate that birds that breed farthest north tend to migrate farthest south. There is not the equal spread of migration that there is in American pipits for example, in which the farther north breeding forms tend to spend the winter near the breeding area of their southern relatives who have meanwhile progressed still farther south for the cold months. Birds that breed in Siberia are found in southernmost India, while birds that apparently nest in the Himalayas do not wander much farther south than the adjacent plains. In southern India birds have been recorded from October 13 until April 19th, but lack of later records does not seem to mean that the birds have gone straight to their breeding grounds. In the spring of 1947 I found the Siberian breeding race of *Anthus hodgsoni* dallying in the foothills of Nepal between five and six thousand feet, into early May. These specimens showed no signs of breeding activity. Futhermore post-breeding birds seem to have a sort of wandering period possibly following local food sources, which takes them all over the eastern Asian mountains in an east or west direction, long before they migrate south. It is this apparent random dispersal which has helped to confuse our knowledge of the species. Specimens of one race may be found on the breeding grounds of another within a very short period after the end of the nesting season.

In this connection it is impossible to do more than point out for future travellers in upper Yunnan, Szechuan and Chinese Tibet, the importance of acquiring some data in regard to the breeding of these tree-pipits. How can these populations retain their identity when their breeding territory is being criss-crossed by birds of neighboring populations 'en passage' virtually during the breeding season ? Or does the very shortness of the breeding season act as a safeguard ? Barriers to interbreeding such as distinctive visual or auditory characters (postulated by Huxley in 'Evolution' Oxford 1938), would seem to be lacking. Territorial barriers are apparently easily overcome. Intergrading among the populations must exist. Possibly then the barriers to complete swamping of these recognizable races are physiological, correlated with an extremely short period of gonadal activity.

(*c*) Moults. Freshly moulted birds are found in the collections taken at almost any season of the year. In this series I have birds in fresh plumage taken in August, October, November, December, February, March and April. Similarly birds in worn plumage are taken at all seasons, although part of the complication here is provided by young birds of the year. Briefly the moult may be summarized as ;

1. First winter plumage acquired by a partial post-juvenal moult in late August-September, excluding the wings and tail. At this stage young and adult become virtually indistinguishable.
2. First nuptial plumage acquired by a partial pre-nuptial moult in April-May.
3. Adult winter plumage acquired by a complete post-nuptial moult indistinguishable from the first winter plumage. Late summer.
4. Adult nuptial plumage acquired by a partial pre-nuptial moult. Late Spring.

Of the three breeding populations which I have been able to distinguish it would seem that the oldest population in time is the northernmost one which breeds right across eastern Siberia, Mongolia and Manchuria to Kamschatka, Sakhalin and northern Japan. This population winters as far south as Travancore on the west and the Philippine Islands on the east, and may well be composed of several breeding strains. However, phenotypically this population appears as one.

A second population seems to be of rather recent origin. Its breeding area runs along the southern Himalayas and up through Yunnan and Szechuan to Kansu, and from there possibly over Korea and Japan (vide A Hand-list of the

Japanese Birds, 1942, p. 27). In winter it wanders down through the foothills with apparently somewhat irregular appearances as far south as Mysore in India or the Philippines. This population appears to be less numerous in museum collections, and it would be interesting to know whether there is any correlation between this and conditions in life. I term this population 'recent' because its nesting locality in the Himalayas and its wintering range in the eastern Indian plains are areas of more recent suitability, geologically speaking, for its occurrence.

A third, and I believe the youngest population, can be recognized. This race breeds in southeast Tibet and the adjacent parts of extreme western China. I have found only four wintering specimens in India and northern Tonkin. La Touche (A Handbook of the Birds of Eastern China, 1925-30, I, p. 420) speaks of a heavily-streaked bird with a very long bill in his collection from Formosa which may also be a specimen of this population. This race occupies the smallest range and would appear to be by far the smallest population numerically. Its location, bounded by high mountains and the arid plateau of Tibet would seem to have presented the required degree of isolation in which significant characters could be allowed to develop. On the southwest, in the Himalayas, south and south-east in Yunnan, and east and northeast in Szechuan, its range is bounded, and the boundary remains to be exactly defined, by the territory of the preceding, or second population.

Schäfer, who has collected this race on its breeding grounds in north central Sikang on the upper reaches of the Yangtze Kiang and Yalung Rivers in an area from Jeykundo south and east to Batang and Tatsienlu, (vide Schäfer,J.F.O., *86*, Sonderheft, p. 204), calls this a rare breeding bird of the palaearctic mountain forest zone from 2700—3300 m. altitude. Its northern limits coincide with the edge of the forest. It is found in clearings in scrub forest, and in open bushy areas. He lists its breeding season as June, July and August (?), although his specimens were non-breeding individuals taken in September and October. By October it is leaving its mountain breeding range and moving south and east into its subtropic winter environs.

Description of the races.

(*a*) The nothernmost race may be characterized as follows; in fresh plumage some seventeen out of forty-five specimens examined appear to be a rich tawny brownish-olive above with very narrow shaft streaks on the feathers of the head and upper back. These shaft streaks run up to about 1.5 mm. in width. In worn birds this measurement still does not become as great as 2 mm. There is considerable variation in the prominence of these streaks on the upper surface, depending on the ground color of the feathers. Some birds are colored so that the streaks blend into their background. In general birds from the easternmost part of the range (Kamschatka) are the dullest, most neutral with the most washed-out streaking. The wing coverts are edged with rich bright buff. On the underparts there are short black streaks, sometimes really spots rather than streaks, on the feathers of the lower throat and breast. These markings are carried down into the upper belly in some specimens, possibly depending on the make-up of the skins, and also well down on the flanks and thighs. The underparts are whitewashed with buff on the sides of the throat, breast and flanks.

In worn plumage this race appears rather greyish-brown on the upper parts and the pale edges to the wing coverts seem enlarged and paler. The streaking on the head and back seems little more pronounced. Below the birds tend to be more whitish and the black spots on the breast seem slightly less pronounced.

(*b*) The middle race found in the Himalayas and up to Kansu can be described as follows: in fresh plumage this race appears tawny olive green above with strongly pronounced shaft streaks on the head and back. The superocular streak in both this and the preceding form is pale and whitish. The streaks on the upper back measure from about 2-2.5 mm. in width. In worn birds this measurement reaches 3 mm. The pale edging to the wing coverts seems narrow and rather dull. Below fresh specimens have the throat tinted buffy and the abdomen and belly rather whitish. The shaft streaks are immaculate black on a light buffy ground and are broad on the lower throat changing to streaklets on abdomen.

In worn plumage the streaks on the upper parts are more pronounced, and the base color has faded to greyish olive-brown. Only the wings and lower rump preserve a hint of the fresh greenish olive tone. The pale edges to the wing coverts have become more washed out. Below, worn specimens seem more pale and lacking in the buffy tone of the fresh plumage.

(*c*) The third population is based on twelve specimens which I have examined from Southeast Tibet,Molasche, Kham, and from Southwest Kansu, India and Tonkin. Only one specimen is in truly fresh plumage. This bird is tawny bronzy-olive above with broad pale edges to the wing coverts. The feathers of the upper back have broad central shaft streaks of rich brownish-black. In this July specimen these are 4-4. 5 mm. in width, while in a worn January bird they measure up to 6 mm. The super/ocular streak is pale citron and the shaft streaks on the head are not prominent, indeed very much reduced. Below, this bird is tawny except for the throat and lower belly, and with dark broad streaks on the lower throat feathers changing to narrow streaklets on the abdomen.

In worn plumage this race appears almost uniform blackish on the back, so prominent have the streaks become through wear. Only the wings and the rump preserve a hint of the dark yellow-olive tone of the fresh plumage, the rest appearing quite tawny. The tips to the wing coverts are faded and very pale buff in color. The underparts appear more whitish and the black streaking on the breast and abdomen is more pronounced.

MEASUREMENTS

Race A.	Wing	Tail	Culmen
45 ♂♂ and ♀♀	81.5-90 (84.54)	57-64.5 (61.0)	12-14.5 (13.17)
Race B.			
18 ♂♂ and ♀♀	80.5-87.5 (84.4)	57-64.5 (61.9)	12-14 (13.14)
Race C.			
12 ♂♂ and ♀♀	84.5-93.5 (87)	60-69.5 (64.2)	12-15.5 (13.95)

As will be noted from the above the third population from Southeast Tibet and Sikang has a tendency to larger size than the other two in all three dimensions given. On the basis of size, the first two races are inseparable, but when the standard deviations are worked out on the bill length alone for the third race as compared to one of the others, the resulting value indicates that the probability is very great that two distinct populations are represented.

NOMENCLATURE

Anthus hodgsoni has had a difficult nomenclatoral career. Richmond (Blackwelder Res. in China, 1907, pt. II, p. 493.) renamed *Anthus maculatus* 'Hodgson' of Jerdon (Birds of India, 1864, 3, p. 873.) as this name, derived from Hodgson, was a nomen nudum and had already appeared in synonomy under *Anthus trivialis*. Hartert (Zusatze und Berichtigungen, 1921-2, Band 1, p. 2094) pointed out that *Anthus maculatus* Jerdon is preoccupied by *Anthus maculatus* Vieillot, 1818 (ex *Motacilla maculata* Gmelin).

Hartert and Steinbacher (Vög. pal. Fauna, Ergänzungsband, 1933, p. 137.) revised the species and restricted the name *hodgsoni* Richmond to the heavily streaked form of tree-pipit more common in the western part of the summer and winter ranges of the species in Asia. At the same time they named the lightly streaked form found in eastern Siberia, Kamschatka and Sakhalin, *Anthus hodgsoni inopinatus*.

A year later Whistler and Kinnear (Journ. Bomb. Nat. Hist. Soc., 1934, xxxvii, p. 96.) discussed this species anew. Unfortunately the authors disagreed with Hartert and Steinbacher and attempted to fix the name *hodgsoni* to the lightly streaked population maintaining that Jerdon's discussion of Hodgson's *maculatus* involved both heavily and lightly streaked birds. At the same time they agreed that the original *maculatus* Hodgson was intended primarily for the more heavily streaked bird.

As the first revisers of the species Hartert and Steinbacher's opinion should undoubtedly stand as pointed out by Mayr (Ibis, 1938, p. 301.). Also, reading over Jerdon's description of this species (tom. cit., 1863, 2, p. 228.) I do not agree with Whistler and Kinnear that this is a composite description. It seems to me to be a rather accurate description of *Anthus h. hodgsoni*. Furthermore Whistler and Kinnear's range data are not entirely accurate. Actually both light and dark streaked birds occur in about equal proportion in Bengal, an area which they feel is more the wintering zone of the Siberian form.

I find that I also disagree with Stuart Baker (Fauna Brit. India, Birds, 1926, iii, p. 281.) and Ticehurst (Journ., Bomb. Nat. Hist. Soc., 1927, xxxii, p. 351.) in regard to the ranges and names for these races. *Anthus maculatus yunnanensis* Uchida and Kuroda (Annot. Zool. Japon. 1916, ix, p. 134.) was described from Mengtz, Yunnan, and I should have been inclined to synonomize it with *hodgsoni* if it had not been that Yamashina (Tori, 1939, x, No. 49, p. 477.) discusses the type specimen of *yunnanensis* and says that it is a member of the northern unstreaked pale form which migrates to Yunnan in the winter 'en passage'. Thus *A. h. inopinatus* Hartert and Steinbacher becomes a synonym of *yunnanensis*.

Anthus maculatus berezowskii Sarudny (Orn. Monatsb., 1909, xvii, p. 41.) was described from a single specimen from Southwest Kansu out of a collection of eight specimens. It was noted that this specimen has darker, wider streaks than the other birds, more like those of *A. trivialis*, and as strongly black in color. This is a fairly accurate description of the most heavily streaked and least common of the three faces from Southeast Tibet and Sikang. Among the specimens in hand from Southwest Kansu there is a single summer bird of this heavily streaked race (taken in July) which I should be inclined to consider a topotype of *berezowskii*. All other Kansu birds examined belong to the less heavily streaked population (*hodgsoni*), while none belong to the most lightly streaked Siberian bird (*yunnanensis*).

There has recently (Ibis, 1948, p. 152.), been a discussion between Mr. H. G. Deignan and Sir Walter Williamson as to the authority for the name *Anthus hodgsoni*. I incline to Mr. Deignan's conclusion that the author of the name is Richmond (in Blackwelder), whether or not the description is in italics or inverted commas, because the rules of nomenclature seem quite clear that where an author publishes, as in edited matter, another author's manuscript name and description of a species or other group, formally stating such to be the case, or where the context implies that such is the fact, the authority for the name is the author of the manuscript so used.

As to making the species *hodgsoni* into a group of races of *Anthus trivialis* (also discussed in the same correspondence), I should prefer to let them stand as species. They are presumably allopatric (contra Stuart Baker, tom. cit. p. 280.) members of a superspecies.

Consequently I would list these races as follows:

(*a*) *Anthus hodgsoni yunnanensis* Uchida and Kuroda.

Synonym: *Anthus hodgsoni inopinatus* Hartert and Steinbacher

Range.—breeds in Siberia east to Kamschatka, Sakhalin, Kuriles and Hokkaido; winters in India in the southwest; Travancore above 4,000 ft., Palni and Nelliampathy Hills, Nilgiris, the Wynaad, Madras Presidency west in the Biligirirangan Hills and north to Jeypore, United Provinces, Bengal, and in the Himalayan foothills at least from Nepal to Northeast Assam (Mishmi Hills), Northern Burma, Yunnan (type locality), Siam, Indo-China east through China, primarily in the coastal areas, Shaweishan I., Korea, Japan, the Riukiu Is. and the Philippines.

(*b*) *Anthus hodgsoni hodgsoni* Richmond.

Range.—presumably breeds along the higher Indian Himalayas from Garhwal (at least) east[1] above 8,000 ft.,[2] Yunnan, Szechuan, Southwest Kansu and possibly Korea and Japan where it may integrate with *yunnanensis* (vide A Handlist of the Japanese Birds, 1942, p. 27.); winters in India as far south as Mysore and Madras Presidency (spec. examined from the Bababudan and Biligirirangan Hills), in Bengal, northeast Assam east through the Indo-Chinese sub-region to China (Hupeh and along the coast), Formosa, Korea, the Riu-kius, Japan and the Philippines.

(*c*) *Anthus hodgsoni berezowskii* Sarudny

Range.—probably breeds in Southeast Tibet and in Sikang Prov., China, the region of Kham and Molasche; wanders to Southeast Kansu (post breeding) and the Lichiang Range of Northwest Yunnan; winters in India, United Provinces (3 spec.), Indo-China, Chapa, Tonkin (1 spec.), and Formosa (?) vide La Touche (op. cit.).

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[1] Whistler (Journ., Bomb.Nat.Hist.Soc., 1945, 45, p.284.) notes that there is no substantiation for this pipit's breeding in Afghanistan.

[2] *Anthus hodgsoni burzil* Koelz (Proc. Biol. Soc. Wash., 1939, 52, p.75.) is a synonym of *A. trivialis*.

KEY

A key for these races would be as follows:

A. Smaller.

a. with prominent streaks on head but nearly obsolete streaks on back. never as great as 2mm. in width . . *A. h. yunnanensis*

b. with narrow but prominent streaks on head, and back reaching 3 mm. in width in worn plumaged birds . . *A. h. hodgsoni.*

B. Larger.

c. with strong broad streaks on back reaching 6 mm. in width in worn birds. Head streaks relatively reduced . . *A.h. berezowskii.*

NOTES ON POONA REPTILES

BY

GARTH UNDERWOOD

The following notes are on reptiles collected during ten months stay in Poona with the army in 1945. All the specimens described came from the area bounded by the hills on either side of the road going to Pashan village, which is to the west of Poona itself.

TESTUDINES

Lissemys punctata Bonaterre.

The only specimen was a recently hatched young from beside Pashan tank, on 5-7-47. It measured 43 × 33 mm.; the umbilicus was large ca. 2 × 3 mm. on a line joining the anterior edges of the posterior plastral flaps. There were 4 crescentic folds of horny skin on the wrist and 1 under the heel, the distinction between coastal and extracoastal areas was not apparent, the whole surface was ropy. The carapace was brown with scattered black spots the plastron reddish yellow with a pair of brown patches.

SQUAMATA

SAURIA.

GEKKONIDÆ. (Marathi Pāl, पाल)

Hemidactylus triedrus Daudin.

13 specimens were examined, 6♂, 7♀. The labials varied; upper 7-10, lower 7 or 8 (6 and 9 unilaterally, 2 cases each) Internasals 3, except 1 case 2 and 1 case 4 (2 median ones very small). Subdigital lamellæ under 1st digit 6-8 (6 in 3 cases, 8 in 1 case), under 4th digit 7-9 (7 in 1 case) In the males, femoral pores 12-14 (9 and 11 unilaterally one case each) separated by 1 or 2 median scales.

The largest specimen, ♂, was snout to vent 82 mm., tail broken. Mature ♀♀ were about 10 mm. shorter than the ♂♂. Ground colour brown with 4 light bands on back, whitish partly filled in with brown and edged with dark reddish brown, tubercles in the bands white: one band across occiput, white anteriorly dark brown posteriorly; dark brown band from snout accross lower half of eye to point above ear, edged with white; supraocular fringe yellowish; light greenish across top of head between eyes. Those with complete tails had 7-9 dark bands the last several extending onto the underside.

Between 1-5-45 and 18-5-45 3 ♀♀, bodies 61, 61 and 72 mm., were obtained carrying 2 eggs each.

23-5-45 a ♀, body 59 mm. laid 2 eggs 12½ × 10½ mm.

22-6-45 a ♀, body 62mm. laid 2 eggs 11½ × 9½ mm.

This gecko was found only at night time in fields or amongst rocks where there was plenty of grass. 5 small specimens, bodies c. 30-40 mm., were found in termites' nests, in July and August.

Hemidactylus brooki Gray.

16 specimens were examined, 7 ♂, 5♀, 4 juv. The labials varied from 7-11 (12 unilaterally one case) upper and 8 or 9 (7 unilaterally, one case) lower. 2 specimens had the small 3rd pair of postmentals mentioned by Smith (Fauna of British India, 2nd ed.). Subdigital lamellæ: 5 under 1st digit, 7 under 4th, 12 cases (4 under 1st unilaterally, one case); 4 under 1st, 6 under 4th, 3 cases; 1 case under 1st, hands 4 feet 5, under 4th hands 6 feet 7. Femoral pores 7-12 on each side, separated by one or none; one specimen 6 on each side separated by 7. The colour ranged from just perceptible brown spots on a light ground to dark spots on a brown ground. On 26-5-45 2 ♀♀ were obtained carrying eggs but egg laying was not observed.

Nearly all the specimens were obtained from under or amongst rocks.

Hemidactylus gracilis Blanford.

2 specimens were examined, both ♂. Since Smith records only 4 specimens of this gecko these two are described separately.

The first was obtained 1-5-45 at night in a water worn gulley on the hillside. Labials, upper left 7 right 9, lower 7; rostral medianly divided; 12 rows strongly keeled scales on back, tail 4 rows enlarged keeled scales dorsally transversely enlarged row ventrally (on the half of the original tail which remained). Subdigital lamellæ under 1st digit hand 5, foot 4, under 4th digit, hand 7, foot 9, otherwise as described by Smith. Colour; grey above, thin entire vertebral line flanked by thick lines running from snout to base of tail which are broken into rectangles on the body. Down each side ventrolaterally a thin broken line. On the tail the three lines from the back form a network. Very fine spots on the belly. Snout to vent 35, tail (half reproduced) 32, testes 7 mm. long.

The second was obtained 18-5-45 at night on a bank beneath a bush near a pile of stones. Labials, upper 8, lower 7; 12 rows keeled tubercles on back; subdigital lamellæ 1st, hand and foot 5, 4th hand 7, feet 8 & 9. Colour grey above, thin vertebral line on anterior half of body only, forks on occiput between eyes, row of rectangular spots each side, broken line ventrolaterally each side, very small spots on belly, small spots on reproduced tail, snout to vent 37, tail (reproduced) 28.

This one was kept alive for about 5 months during which time it fed sparingly on termites; at the end of this time, by accident a *Mabuya trivittata* got at it and ate it.

Hemidactylus leschenaulti Dum. & Bibr.

Only one specimen was examined. Many specimens (presumably *leschenaulti* and not *flaviviridis*) were observed in the country by night exclusively on tree trunks and by day in shady buildings (but not human habitations) on walls and posts. There were many in Poona fish market.

Eublepharis macularius Blyth.

A single specimen was obtained 28-4-45 at about midnight crossing the road, a ♀. It had 4 internasals; labials, upper 8 lower 7; a projecting tubercular ridge covering the anterior edge of the ear opening and a similar smaller ridge above and behind the opening; in other respects as described by Smith; snout to vent 117, tail 49.

The colouration resembles that described by Smith for a specimen from Khandesh district. Top of head dark brown mosaic on brownish grey ground; light band on neck spotted brown; dark brown band across the thorax and lumbar region with yellowish network; across both midbody and pelvis light band with small brown spots; tail as head but larger scale mosaic; limbs brownish grey with small brown spots mostly on distal parts.

When disturbed it made an extraordinary noise like the running down of a watch with no balance wheel. The noise started and stopped suddenly accompanied by sideways jerks of the head and opening of the mouth without, however, any attempt to bite. In addition to insects a *Hemidactylus brooki* was eaten but *H. triedrus* was not touched. It died 5-6-45. The ovaries were very small.

AGAMIDAE. (Marathi Sargotā, सरगोटा)

Sitana ponticeriana Cuvier.

37 specimens were examined, 19 ♂ and 18 ♀. Only in one case was the hind limb so short as to reach no further than the front of the eye; of the remainder the hind leg reached between eye and snout 8 cases, approximately to end of snout 11 cases, beyond snout 17 cases. There appeared to be a positive correlation between tail length and the length of the hind limb. For those specimens with complete tails $\frac{\text{tail length}}{\text{body length}}$ varied as follows : I case leg reaching forward edge of eye 1·92, 4 cases leg reaching between eye and snout average 2·04 ; 6 cases leg reaching end of snout av. 2·20 ; 13 cases leg reaching beyond snout 2·33. 2 specimens (tail = 1·9 × body) had no enlarged scales on the flank, snout to vent 50 and 54, the second was a ♀ with 12 developing eggs. They therefore approached the larger form described by Smith.

Generally light sandy coloured band down back, dark brown laterally. 5 (29 cases) or 6 (11 cases) dark brown rhomboidal spots, a light vertebral line dividing them, not always very distinct, in 7 cases expanding in each rhombus. One specimen had the 2 halves of the 5th rhombus longitudinally displaced. 20 specimens had light marks on the dark area outside the dorsal band opposite the junctions of the rhombi ; 3 specimens had the 1st rhombus bluish, one had cobalt blue nape and pale blue vertebral line, 2 had oval dark brown marks in the triangular spaces between successive rhombi and the edge of the dorsal band. The head generally had some dark marks, 2 specimens had none. A band between the eyes, 21 cases or a pair of parietal marks, 10 cases (both 1 case). A median bar before the eyes 11 cases, sometimes also one above snout 3 cases ; a mark behind each eye 6 cases ; a band from below or behind the eye onto side of neck, 6 cases ; paired occipital marks, 5 cases ; paired temporal marks, 4 cases ; median nuchal band, 3 cases.

With regard to breeding, habits the data given below were noted on various dates. The larger ♂♂ in breeding attire had the gular appendage bright blue anteriorly, black in the middle and bright vermilion posteriorly onto the belly. The smaller ♂♂ were not so brilliantly coloured but some nonetheless appeared to be in breeding condition.

Date	Body length, mm.	Gonads	Gular appendage
8-4-45 to 27-6-45	47-67		Brilliantly coloured ♂♂ were obtained.
4-5-45	43	Testes 5 mm.	Moderately bright.
6-5-45	47	— 4 mm.	Brilliant.
15-6-45	42	— 4 ½ mm.	Moderately bright.
20-5-45	67	— 6 × 4½ Epididymis swollen.	Brilliant.
6-5-45	38	Ova small.	
25-5-45	46	11 eggs, c. 4 mm. diam.	
5-6-45	42, 46 & 47	Bulging with eggs.	
7-6-45	54	12 eggs, c. 4½mm. diam.	
7-6-45	60	No eggs.	
15-6-45	45	8 eggs, c. 5 × 8 mm.	
20-6-45	54	Bulging with eggs.	
2-7-45	47	9 eggs, 10 × 5 mm.	
14-7-45	Egg laying observed.		

In an interval between showers of rain on 14-7-45 my attention was drawn to the fact that a lizard was digging a hole in the camp area. When I arrived I found a *Sitana ponticeriana* head first down a narrow hole to about the length of its body. This was at 2·25 p.m. Shortly afterwards it came out of the hole and rested by the side. At 2·31 egg-laying commenced. The hind legs were astride the hole and the fore legs rested in a normal attitude on the pile of excavated material, the tail was not used for support. The expression of the first egg appeared to require considerable effort. After that they came more easily. The arrival of each egg was preceded by ripples of contraction on the belly and usually by a forward movement of the body, without movement of the feet. Before each egg dropped the lizard usually lowered the vent into the hole. The intervals between the eggs were variable. At 2·59 filling commenced. First the lizard turned around and used its snout to tamp down the eggs. Then it began scraping material back into the hole. Only the forelimbs were used for scraping, the hind limbs being straddled so that the material scraped passed between them. About half a dozen strokes were made with each forelimb alternately. After each short spell of scraping the lizard turned to tamp the material. The action of tamping was very rapid and might fairly be described as a vibratory movement. At first the material was scraped from a little greater than a quadrant around the hole. As filling proceeded material was scraped from an increasing distance from the hole up to c. 15 cm. Some of the material scraped failed to reach the hole and, the most remarkable feature, in one area the scraping was not even in the direction of the hole. During another shower of rain the lizard departed.

Most of the specimens were obtained by day in the fields and a smaller number from the hillside ; a few were caught by night.

Calotes versicolor Daudin.

13 specimens were examined, 10 ♂ and 3 ♀. The labials were upper 10-14 mostly 12 (22 counts) and lower 9-15 mostly 13 ; the uppers ranged from 2 more than to 3 less than the lowers, mostly equal in number ; the midbody scale rows ranged from 36-47.

With regard to breeding season the following observations were noted.

Date	Body mm.	Gonads	
9-6-45	129	Testes 15 mm.	Epididymis not swollen.
19-6-45	96	— 13½	— swollen.
2-7-45	136	— 11½	— —
6-6-45	85	6 eggs in each oviduct, 14 × 7–8 mm.	
12-6-45	97	Oviducts empty.	

The markings characteristic of the young persisted in many adult ♂♂ as well as in the ♀♀. There were frequently dark bands on the tail and sometimes a yellowish zone around the base in the ♂♂.

They were commonly seen around buildings and in the countryside in bushes the density of which gave them cover.

Calotes rouxi Dum. & Bibr.

A pair, presumably a breeding pair, were obtained under a tree at Khandala, 17-6-45.

♂ labials, upper 9, lower 8 ; midbody rows 56 ; body 60 mm., tail 134 mm
♀ — , — 8, — 7; — — 52 ; — 65 mm., — 129 mm.

They were kept in captivity and the ♀ laid 9 eggs buried in the sand on the floor of the box on 8-7-45 ; they measured 11 × 6 mm. ♂ head dull brown ; middorsally brown ; from behind eye onto sides black speckled with yellow, upper lip and sides of neck turn brick red. ♀ dull yellowish buff, nape and knees russet, lips lighter.

SCINCIDAE. (Marathi Sāpsurūlli सापसुरळी)

Mabuya carinata Schnieder.

Only three specimens were examined, all ♂. One, body 100 mm., had testes 8 mm. and the sides of the body vermilion 19-6-45. They were commonest among the dead leaves and grass at the base of bushes.

Mabuya trivittata Hardwicke & Gray.

One ♂ examined caught in a tent. Hind limb reached fingers ; body 72 mm. tail (half regenerated) 75 mm. Testes 5 mm. ; epididymis not swollen. Hind limbs spotted yellow ; the pair of lateral stripes on each side showed a curious abnormality.

Riopa guentheri Peters.

2 specimens were seen and examined. They were obtained by a man digging a garden. 1 adult, body 110 mm., tail 95 mm. ; snout to axilla 22, axilla to groin 90. The other was a juvenile obtained 14-6-45 body 42 mm., tail broken ; snout to axilla 12 mm., axilla to groin 22 mm. ; umbilical scar on belly. Dorsolateral stripe each side and smaller stripe between this and middorsal line; belly pinkish, surviving half of tail bright red.

LACERTIDAE. (Marathi Tsopai, चौपई)

Ophisops jerdoni Blyth.

9 specimens were examined, 6 ♂, 3 ♀. Transeverse series of ventral plates ♂ 21-28, ♀ 26-29; scale rows at midbody 28-34; prefrontals separated by a small scale 4 cases; 4th labial subocular 2 cases, right side only 1 case; submaxillary shields, 6 pairs 5 cases, 5 pairs 2 cases, 4 pairs 2 cases one of these having only the first two pairs in contact; 1 specimen had a long narrow scale separating the supraoculars from the supraciliaries.

With regard to breeding season the following were noted

Date	Body	Gonads.
24-5-45	40	Testes 4 mm.; epididymis swollen.
6-6-45	40	— 4½ — —
4-5-45	36	Eggs not more than 1 mm. diam.
22-6-45	39	♀ caught, in captivity laid 7 eggs 1-7-45. 6½ × 4 mm., pale yellow, stuck together.

Brown above, two dorsolateral stripes nearly white on each side, black spots between them and (1 exception) along upper margin of upper stripe. Most of the specimens had lemon yellow on the neck and greenish yellow down the flanks.

These lizards were extremely fleet and difficult to catch. They ran so rapidly that at close quarters it was frequently impossible to follow the movement with the eye. They were found by day only on the stony hillside, taking refuge under stones and in crevices.

VARANIDAE. (Marathi Ghorpad, घोर्पड)

Varanus monitor L.

This appeared to be fairly common in the district. Most of the specimens obtained were juveniles. The largest in which the juvenile colouration persisted was body 375 mm., tail 530 mm., a ♀. The end of the tail was light yellow. A specimen of body 275 mm., tail 385 mm. was kept in captivity for sometime; it would eat *Calotes versicolor* up to about 100 mm. body length. The end of the tail protruding from the mouth of the *Varanus* after the lizard had been swallowed was broken off by 'dusting' on the ground.

SERPENTES

Typhlops braminus Daudin.

3 specimens were obtained, they were quite black above.

Uropeltis phipsoni Mason.

1. specimen, 14-10-45

Eryx conicus Schneider.

1 specimen, 25-5-45

Elaphe helena Daudin.

2 specimens were obtained; both had 6 infralabials in contact with the anterior genials and the 7th infralabial the largest, otherwise they conformed to the description in the F.B.I. The coloration agreed quite well with the description in the F.B.I.; the cross bands contained 2 white ocelli on each side and the interstitial skin of the sides was light blue, without the festoon marklings; the neck pattern was type 1.

Oligodon arnensis Shaw.

1 specimen; loreal separate; fairly broad cross bands, 30 on body, 6 on tail.

Lycodon sp. (**aulicus ?**)

1 specimen, ♀, 588 mm. (*b* 475 *t* 93) Anterior nasal larger than posterior; oreal in extensive contact with internasals; temporals 2 + 3, 10 supralabials, 4, 5 & 6 touch eye. V 193, C 67. Coloration: considerably more cross bands than F.B.I. *aulicus*; light slightly purplish brown above, 31 cross bands on back, anterior ones white edged and streaked with brown, white flecking on sides forming vague expansions of bands, by 10th stripe brown edging faded, by 18th white blotch only, by 25th white edging on 4 middorsal scales only, on tail 4 just distinguishable marks; head colour of body, back of head light brown spotted chevron.

Natrix piscator Schneider.

Seen in Mutha-Mula river. 1 juvenile caught at Khandala 17-6-45 ; 10 supralabials 5th and 6th meet eye, left side 6 infralabials meet anterior genial. V 167, umbilical scar 147–149, C 77.

Macropisthodon plumbicolor Cantor.

Appears to be moderately common. 1 ♀, 787 mm. (body 692 tail 95 +) was found on the hillside 5-6-45 during the dry weather. It contained 10 eggs. In the mouth and throat were 4 nematodes 30 or 40 mm. long. Perhaps they upset the snake and caused it to come out before the rain.

Bungarus caerlueus Schneider.

1 juvenile 30-6-45, length 320 mm. (body 277 tail 43). V 210 umbilical scar 190–193 C 48.

Naja naja L.

1 specimen, 21-10-45.

Vipera russelii Shaw.

1 juvenile, 17-6-45, length 273 mm. (body 324 tail 39).

Echis carinatus Schneider.

1 specimen, ♀, 21-6-45.

A FURTHER NOTE ON THE BEARDED PIG IN MALAYA

BY

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(Raffles Museum, Singapore).

(With a text map)

The Bearded Pig, *Sus barbatus* Müll., was described from a specimen taken in the Banjermasin district of south Borneo. It would appear to be plentiful in suitable areas over at least the greater part of the island, and, unless the much debated *Sus gargantua* Mill. is valid, is the only pig occurring there. Another Bearded Pig, *Sus oi* Mill., at present regarded as a western race of the Borneo animal, was described in 1902 from a single specimen taken on the Indragiri River, in Sumatra. It is now known to be fairly plentiful in parts of the country, particularly the north-eastern section. It has also been recorded from several of the islands in the Rhio Archipelago (Batam, Bintang, Durian, Galang, Kundur, Sauh and Ungar), immediately to the south of the Malay Peninsula.[1]

There are a number of animals, of which the most conspicuous and best-known is probably the Orang-Utan, *Pongo pygmaeus* (Linn.), which occur in Sumatra and Borneo, but are absent from the Malay Peninsula. In general the faunas of the two islands show a considerable affinity, and to some extent they are distinct from that of the tongue of mainland running down between them. On general principles, it was therefore assumed that the Bearded Pig would not be found naturally feral in Malaya. When the first specimens came to light various ingenious explanations were put forward to account for their arrival from one of the islands. These are summarised well by Mr. J. E. Kempe in a previous number of this Journal (Kempe, 1946 : 281–285), but unfortunately the author leaves the impression that there may still be some doubt about the animal's status in the Peninsula. Actually the official view was given in 1940, when the late F. N. Chasen, then Director of the Raffles Museum, wrote 'there is . . now no need to assume an extra-limital origin for the few much discussed Malayan specimens recently shot in Pahang and Johore' (Chasen, 1940 : 192, footnote No. 2).

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[1] *Sus barbatus* Müller, Tijdsch. nat. geschied. physiol. v. (1 and 2), 1838, p. 149 : Banjermasin, south Borneo.

Sus oi Miller, Proc. Biol. Soc. Wash., xv, 1902, p. 51 : Indragiri, east Sumatra.

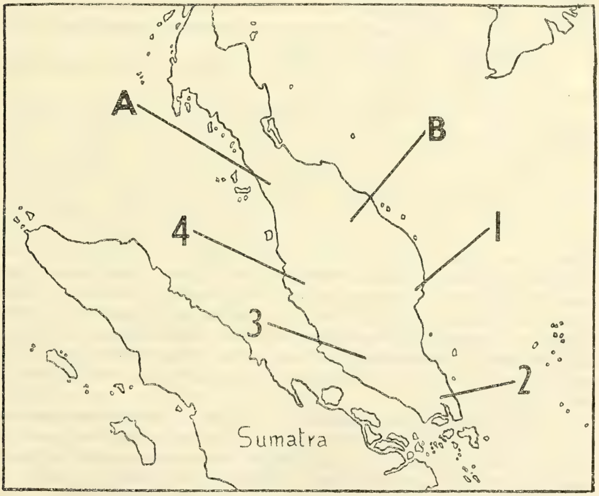
Sus gargantua Miller, Proc. U.S. Nat. Mus. xxx, 1906, p. 743 : south-east Borneo.

Revisions, see : Jentink, Notes Leyden Museum, xxvi, 1905 : Miller. Proc. U. S. Nat. Mus. xxx, 1906, p. 737 : Boden Kloss, Journal Straits Branch Royal Asiat. Soc., No. 83, 1921, p. 147 ; Tucker, Proc. Zool. Soc., 1931, p. 491.

During the course of his paper Mr. Kempe quotes four of the published records of the occurrence of *Sus barbatus* in the Malay Peninsula. There are actually a further three references which he overlooked, and a most important additional record has been established recently by specimens taken in 1947. It would therefore seem to be of interest to summarise the data now available, and to show in total the evidence on which it can be taken that the Bearded Pig is definitely indigenous to the Malay Peninsula, and still present on both sides of the main mountain chain.

NEOLITHIC RECORDS

Two of the records (marked A and B on the accompanying map) are based on the finding of tushes among other animal bones



A map of the Malay Peninsula south of the Isthmus of Kra, showing the areas from which the Bearded Pig, *Sus barbatus* subsp., has been reported. Letters refer to finds among deposits left by neolithic cave-dwellers, and figures to contemporary records. For fuller explanation, see text pp. 633–5.

in material left by neolithic cave-dwellers. I have examined such of the specimens as were brought back to the Raffles Museum. It is not possible to assign them definitely to one or other of the two races at present recognized, but there would seem to be no doubt that they are from a *Sus barbatus* subsp. The sites from which they were obtained are,

(A) Bukit Chuping, Perlis. Excavated by Mr. H. D. Collings in March, 1936, (Collings, 1937 : p. 98).

(B) Gua Madu, Kelantan. Excavated by Mr. M. W. F. Tweedie in July and August, 1939 (Tweedie, 1940 : p. 7).

It will be seen that one of these caves is on the west side of the Peninsula, and the other on the east. In both cases tushes of the Bearded Pig were fairly numerous, and nearly as plentiful as those of the Wild Pig, *Sus cristatus* subsp. At the present time the former is certainly the more formidable and wary of the two. There is no reason for assuming that their physiques and temperaments were markedly different 1,500 to 2,000 years ago, and on this evidence it must be taken that a *Sus barbatus* subsp. was plentiful over northern Malaya, at least, during this period.

CONTEMPORARY RECORDS

The contemporary records now available come from four areas (marked 1 to 4 on the accompanying map), again covering both coastal plains. At best the differences between the Bornean and Sumatran races of living pigs are slight. If they are acceptable, the material so far collected under the present category should be ascribed to the Sumatran *Sus barbatus oi* Miller.

The four areas, listed in the chronological order in which the records were first published, are,

(1) The Pekan District of Pahang. The first specimen obtained from here was a sow killed by Dr. W. S. Leicester in 1918. Three years later Mr. J. E. Kempe, M.C.S., obtained a skull of a boar taken by a Chinese towkay in the same neighbourhood (Moulton and Robinson, 1922 : pp. 202–203). There is now no trace of the former in the Raffles Museum reference collection. It does, however, still contain a fine boar's skull labelled ' Pahang 1922 ' which, from correspondence with Mr. Kempe, would appear to be the example obtained in 1921. Several other Bearded Pigs are said to have been shot in this area subsequently, but unfortunately there is no formal record of them. In 1926 Dr. W. Linehan, M.C.S., told Mr. Boden Kloss in a letter that about ten had been killed the previous year, and enclosed a photograph of one of the dead animals, but he left the district before he could obtain any specimens (*vide* Kloss, B. 1931 : p. 104).

(2) The Kota Tinggi district of Johore. Several examples are said to have been taken in this area in the nineteen-thirties, and on one occasion a collector from the Raffles Museum was treed for more than an hour by an old boar. Unfortunately there is only one formal record, a fine head presented to the Museum by Mr. G. B. Reginato in 1934.

(3) In addition to the animals from the Kota Tinggi area, there is also an unconfirmed record of the Bearded Pig from the

neighbourhood of Genuang, near Segamat, some 85 miles north-west of Kota Tinggi, on the west side of the Peninsula. In 1935 the late F. N. Chasen was in correspondence with a planter, Mr. H. E. Burgess, who described pig which had visited his estate about 1911 and 1913, which would seem to be of this species. Mr. Burgess's account of the animals was subsequently published in this Journal (1936 : pp. 253–254).

(4) The Ulu Bernam district of Perak. More recently there have been reports of a peculiar pig in this neighbourhood, and in August, 1947, an old boar was shot, and the skull sent to the Selangor Museum. Four months later, in December, a much younger animal was taken, and the skull and skin preserved. Through the courtesy of Mr. H. T. Pagden, Acting Director of Museums, F. M., I have been able to examine both the skulls. They undoubtedly belong to *Sus barbatus oi*, though that of the older animal is peculiar in that it is relatively shorter than the normal run. Pig skulls are, however, subject to considerable variation, and it matches satisfactorily with one of an old boar killed in Sumatra a number of years ago.

Discussion

If, as would seem probable, the Bearded Pig was fairly plentiful and widespread in the Malay Peninsula some 1,500 to 2,000 years ago, one would like to know what has happened to it since then. Before the cave tushes were found, when the animal was known only from the few specimens taken and seen round Pekan, in Pahang, and the unsupported record from Genuang, in Western Johore, it was suggested that small numbers might occasionally be finding their way across the water from Borneo or Sumatra, and even that the reported examples might be the relics of a mythical herd liberated for sporting purposes by a Mohammedan Sultan. It might, of course, still be argued that the pig died out in Malaya about a 1,000 to 500 years ago, and that the recent specimens are derived from stock re-introduced by one of these channels. On the whole, however, bearing in mind the diverse places from which it has now been reported, it would seem most likely that it has lingered on in much reduced numbers in a few, isolated spots.

In Borneo the Bearded Pig would appear to be found most frequently in the immediate neighbourhood of rivers, on cultivated ground, and in general open country, in that order of preference. Further it would seem that though it frequently moves through jungle, and may therefore often be seen there, it is actually doing the greater part of its feeding in the open, either in natural clearings or on cultivated ground. Recently I have had an opportunity of discussing the matter with Mr. E. Banks, who was for many years Curator of the Kuching Museum. From this conversation I gathered the impression that it normally inhabits a rather damper and less covered terrain than the wild pig of Malaya.

There is further no doubt that in Sarawak at least the Bearded Pig indulges in irregular migrations or eruptions (Shelford, 1916 : 42-43. Banks, 1931 : 22-23). A particular area may be invaded one season, and then not troubled again for a number of years. Apparently when moving the pigs do so discretely over a wide front, and in the jungle one normally meets only two or three at a time. When the migrating animals reach a river, they collect in groups ranging from a score or more up to several hundred individuals, either feeding or preparing to cross together.

It is generally accepted that the thick jungle which clothed almost the whole of the interior of the Malay Peninsula until recently, when some of the areas were opened up for the planting of rubber, is of considerable antiquity. But there are grounds for disputing this. Certain of the animals, such as the Sĕladang, *Bos gaurus hubbacki* Lydd., are much more likely to be relics from the fauna of a more open terrain. It is also difficult to see how the apparently large population of neolithic man can have existed under conditions similar to those occurring a hundred years ago. It would, in fact, seem more likely that the landscape was more open, and the climate drier, at the beginning of the first millennium A.D. If that were so, the spread of the jungle can be taken as the natural consequence of an increase in the annual precipitation. In the intermediate period, there must have been wide areas of fairly open, damp country. One would suggest that then the Bearded Pig, which had found its way into southern Malaya from Sumatra, flourished exceedingly. Cave-dwelling man, on the other hand, may well have found the damp conditions troublesome, and thus begun a decline in numbers which the gradual spread of the dense forests completed. As they extended their range the Bearded Pig, too, was driven back into a few isolated pockets.

In a short note supplied to the editor of the *Malayan Nature Journal* in January, 1948, I suggested that the few specimens recorded from Pekan and Kota Tinggi might represent small, irregular eruptions, comparable to the movements that have been recorded from Borneo, arising from a pocket surviving in the Tasek Bĕra area of southern Pahang. It is significant that Mr. E. W. Mumford (of the Malayan Police Service), in a letter to Mr. Boden Kloss, said that the Bearded Pig usually arrives in the neighbourhood of Pekan during the monsoon period, from November to April (quoted in Kloss, 1931: p. 104).

The record from Genuang, in north-western Johore (of which I was not then aware), and the specimens from the Ulu Bernam district of Perak, would seem to extend this principle, without affecting its validity as an explanation of the origin of the east coast examples. It would, in fact, seem most likely that the Bearded Pig has survived in Malaya from Neolithic times in a number of small pockets in isolated areas, from which it is erupting at intervals into more densely inhabited ones. It may well be that the attention drawn to it by these recent papers will elicit further formal records. Large numbers of pigs are shot in Malaya each year, but there can be no doubt that very few of them are ever examined critically. A full-grown boar of the Bearded Pig is an unmistakable beast. He is also a most formidable and wary one, and individuals straying into a hunted area might easily elude capture. On the other hand, younger specimens, taken with the ordinary wild pig, though obvious to an interested person, would certainly arouse little attention in a Chinese sportsman shooting for meat, rather than for the benefit of the readers of learned journals.

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A LIST OF BIRDS OBSERVED IN CHITTAGONG, E. BENGAL, DURING 1944 AND 1945

BY

R. M. SIMMONS

(*With a map*)

Though this list is primarily one of birds observed in the immediate neighbourhood of Chittagong town some reference is made to observations elsewhere in East Bengal.

The list is necessarily very incomplete due to the period during which it was compiled being abnormal on account of the war and the fact that access to many areas was difficult for a civilian. Secondly only limited time could be devoted to the business of observation In these circumstances the only territory where intensive observations could be carried out was confined to that immediately round the compiler's bungalow. Elsewhere it was only possible to make casual observations in the course of the day's work.

The period covered by these notes is from April 1944 till January 1945 and from April 1945 till the middle of August 1945.

Chittagong is situated a few miles inland from the sea at the head of the Bay of Bengal on the north bank of the tidal estuary of the river Karnaphuli. A low range of hills running parallel to the coast peters out in a series of hillocks in the middle of the town. Between these hills and the sea is a narrow coastal belt of low-lying ground, partly paddy-fields and partly close cultivation round ' bastis fairly thickly planted with trees, areca palms and clumps of bamboo. The hill ranges north of Chittagong are thickly forested, except in the immediate neighbourhood of the town where they have been cleared of the primary growth and are covered with coarse grass and scrub jungle; in the residential cantonment area they are well planted with various shade and flowering trees and are set with bungalows and the gardens surrounding them.

Unfortunately it was not possible to make any detailed study of such specialized biotopes as the forest or the sea shore. Elsewhere the area was chiefly remarkable for the absence of many of the more familiar species of peninsular India rather than for the presence of many unfamiliar ones. There was, however, evidence of a Burmese influence.

Lastly it must be mentioned that the list is compiled entirely from observations in the field and no bird was shot to establish its identity.

Corvus macrorhynchos. Jungle Crow.

Common resident. Nesting in December and January. Less numerous than the House Crow. A very large bird.

C. splendens. House Crow.

Particularly numerous near habitation.

Dendrocitta vagabunda. Tree-pie.

Resident and a common garden bird. Nesting in June and July. Newly fledged young seen in July and August.

Parus major. The Indian Grey Tit.

Only seen on 3 occasions; twice in April and once in June. On all 3 occasions a pair of birds was seen which suggests that they breed in the neighbourhood.

Turdoides somervillei. Jungle Babbler

Not seen by me, but reported twice (on 9-5-45 and 15-5-45) by reliable observers. Old residents of Chittagong told me that they were fairly common garden birds before the war.

Timalia pileata. Red-capped Babbler.

Appeared to be fairly common on hillsides covered with secondary growth.

Aegithina tiphia. Common Iora.

Resident. Common garden bird. No male was observed to have any black on the head during any season of the year.

Chloropsis aurifrons. Golden-fronted Chloropsis.

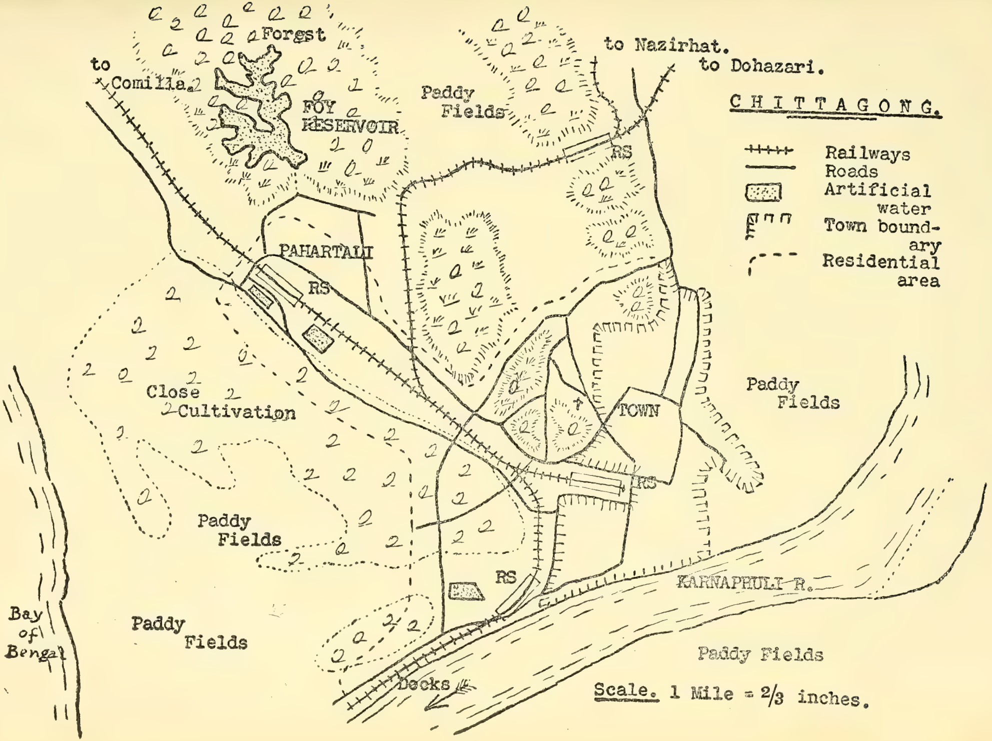
Fairly common in outskirts of forest and occasionally visiting gardens.

Molpastes cafer. Red-vented Bulbul.

The commonest bulbul. Nesting in April, May and June. Gathered into large flocks in October.

Otocompsa jocosa Red-whiskered Bulbul.

Appeared to be a local migrant and was only observed about compounds from November to January. At other times was only seen in forest areas.



CHITTAGONG.

Scale. 1 Mile = 2/3 inches.

Railways
Roads
Artificial water
Town boundary
Residential area
to Comilla.
Forest
FOY RESERVOIR
Paddy Fields
to Nazirhat.
to Dohazari.
RS
PAHARTALI
RS
Close Cultivation
TOWN
RS
Paddy Fields
Paddy Fields
RS
KARNAPHULI R.
Bay of Bengal
Paddy Fields
Docks
Paddy Fields

O. flaviventris. Black-crested Yellow Bulbul.

Appeared to be a local migrant and was only seen about compounds in November and December.

Phoenicurus ochruros. Black Redstart.

Only seen once in late March 1944. The actual date was not recorded as I did not commence keeping systematic notes till April.

Copsychus saularis. Magpie-robin.

Resident and plentiful. Nests found in April and May. First newly fledged young seen on 9-5-45.

Monticola solitara. Blue Rock-thrush.

Winter visitor. Two distinct varieties were observed. The more common had no trace of chestnut on the under parts, the other had the lower breast and belly chestnut.[1] The habits of both were identical. First seen on 8-10-44 and last on 16-4-45. Only one hen was observed. The bird is very shy of being watched, even from a distance, though it will sit quite close if it thinks it is not observed.

Siphia parva (albicilia). Eastern Red-breasted Flycatcher.

Winter visitor. First seen 2-10-44 and last 19-4-45. The only flycatcher observed. They were fairly common but none of the red-breasted variety were seen.

Lanius cristatus. Brown Shrike.

Winter visitor. The common shrike of Chittagong. First seen on 23-9-44 and last on 11-5-45. No other shrike was seen in the immediate neighbourhood of Chittagong, but another (possibly *L. nasutus.*) was common in Tippera towards the end of the monsoon, but was only observed perching on telegraph wires from moving trains, so I am not sure of its identity.

Pericrocotus peregrinus. Small Minivet.

Though not observed during the period when I kept notes, I am sure I saw small parties once or twice in March 1944.

Artamus fuscus. Ashy Swallow-shrike.

Not seen in the immediate neighbourhood of Chittagong, but quite common near the railway line 10-30 miles north.

Dicrurus macrocercus. King-crow.

Resident. One of the commonest birds. Newly fledged young seen in May, June and July.

D. longicaudatus. Grey Drongo.

Appeared to be a non-breeding visitor only observed in cold weather. First seen 24-12-44 and last 11-4-45.

Chibia hottentotta. Hair-crested Drongo.

Breeding. Newly fledged young seen on 8-6-45. After nesting it seemed to disappear and was not seen after 4-7-45 until I left Chittagong on 23-8-45.

Acrocephalus dumetorum. Blyth's Reed Warbler.

Winter visitor. Found in compound throughout the winter and last seen on 18-5-45. First heard singing on 19-4-45.

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[1] Blue-headed Rock-Thrush (*Monticola cinchorhyncha*) ?—EDS.

Orthotomus sutorius. Tailor-bird.

Resident and common garden bird throughout the year.

Franklinia gracilis. Franklin's Wren-warbler.

Not very common and seemed to be absent, at least from residential area, during June and July.

Oriolus xanthornus. Black-headed Oriole.

The common oriole of E. Bengal.

Sturnia malabarica. Grey-headed Mynah.

Resident. Nesting in April and May. Gathering into large flocks at the end of June when they seemed to move to the more thickly forested areas.

Acridotheres tristis. Common Mynah.

Resident and ubiquitous in the neighbourhood of habitation Newly fledged young seen on 26-5-45.

A. ginginianus. Bank Mynah.

Never seen except at Bahadurabad (Mymensingh District).

Æthiopsar fuscus. Jungle Mynah.

All had yellow eyes. Common but not so numerous as *A. tristis* with which it often associated. Generally seen in pairs. Young birds seen on 24-7-45.

Sturnopastor contra. Pied Mynah.

Probably the commonest of all the Mynahs in Chittagong. Nesting was in full swing by the middle of May.

Lamprocorax panayensis. Glossy Stare.

Not common. Seen in company of Grey-headed Mynahs, feeding on berries of an evergreen tree on 17-4-1945 and 10-5-1945.

Uroloncha punctulata. Spotted Munia.

The only munia seen by me. A pair started nesting in the porch of my bungalow on 9-10-1944 but later deserted; on 26-5-1945 it was noticed that a pair were renovating the nest and fledglings were first noticed at the nest on 20-7-1945. Other birds were seen nesting in July and August.

Passer domesticus. House Sparrow.

Common at the level of the coastal belt, but seldom seen on hilly ground. Most of the bungalows in the cantonment area are built on the tops of hillocks and it was quite unusual to see sparrows in gardens and compounds so situated.

Hirundo daurica. Red-rumped or Striated Swallow.

This was the only swallow seen in Chittagong and only observed in April 1945. Other swallows (probably *H. rustica*) were seen on the Brahmaputra river at Chandpur.

Motacilla alba. White Wagtail.

Common winter visitor. First seen 14-10-1944

M. cinerea. Grey Wagtail.

Winter visitor. A small party of these birds visited the static tank in my garden between 12 and 20 April 1945 and so enabled me to be certain of their identification.

Anthus rufulus. Indian Pippit.

Fairly common on open grass maidans in July and August.

A. hodgsoni. Indian Tree Pipit.

Seen on 4 occasions in compound; twice in October 1944 and twice in April 1945.

Mirafra assamica (?). The Bengal (?) Bush-lark.

Some form of bush-lark was common in more open country, but I cannot be sure of the identification.

Zosterops palpebrosa. White-eye.

A fairly common garden bird in every month of the year.

Cinnyris asiatica. Purple Sunbird.

Not very numerous though one or two birds visited the garden in every month of the year. Young birds seen in latter half of April.

Dicaeum erythrorhynchos. Tickell's Flowerpecker.

Flower peckers are difficult to identify as they are generally seen silhouetted against the sky as they feed on the berries of some parasite growth near the tops of high trees. This species however also fed on the berries of Duranta hedges and so was easily identified.

I believe I also identified *D. cruentatum*, but cannot be absolutely certain.

Dryobates (?). Pied Woodpecker.

I cannot readily distinguish between *D. mahrattensis*, and *D. macei* in the field.[1] Common. Young bird with hen seen on 26-5-1945.

Brachypternus benghalensis. Golden-backed Woodpecker.

Common.

Megalaima lineatus. Lineated Barbet.

Common in well treed portions of cantonment area.

Megalaima haemacephala. Coppersmith.

Very common. Congregated into parties of a dozen or more in October and November.

Cuculus canorus. Asiatic Cuckoo.

Heard on several occasions during end of April and beginning of May 1945.

C. micropterus. Indian Cuckoo.

The common cuckoo of Chittagong and very noisy from January till June, often calling at night.

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[1] Actually differentiation should not be difficult:

Male *mahrattensis* has forecrown brownish-yellow, hind crown orange crimson; brown streaked yellowish-white breast and orange-crimson patch on abdomen.

Female entire crown brownish-yellow.

Male *macei* has entire crown crimson, back much blacker; chin, throat and upper breast unstreaked fulvous, long black moustachial streaks and no red abdominal patch.

Female entire crown black.—EDS.

Clamator jacobinus. Pied Crested Cuckoo.

Scarce and not observed in the neighbourhood of Chittagong. First heard 22-5-45 near the railway line some 33 miles north of Chittagong.

Eudynamis scolopaceus. Koel.

Not as noisy as the Indian Cuckoo. Heard during the months April—July and September and October.

Centropus sinensis. Crow-pheasant.

Seen round Foy reservoir.

Psittacula fasciatus. Red-breasted Parakeet.

Fairly common. It was the only Parakeet I saw. It's distinctive call is sufficient to identify it even when too far away to observe coloration.

Coracias b. affinis. The Burmese Roller.

Not very common and only seen during months June—November. The only birds I was able to identify were all of this species.

Merops orientalis. Green Bee-eater.

A common bird in and around compounds during the months October—June. Nesting sites not found.

M. superciliosus. Blue-tailed Bee-eater.

Nested in large numbers in sides of sandy hillocks round my compound in April. Disappeared after July till some time early in the year.

M. leschenaulti. Chestnut-headed Bee-eater.

Uncommon and only seen during April and May.

Ceryle rudis. Pied Kingfisher.

Fairly common and always seen on Foy reservoir.

Alcedo atthis. Common Kingfisher.

Fairly common.

Halcyon smyrnensis. White-breasted Kingfisher.

A common garden and compound bird.

Ramphalcyon capensis. Stork-billed Kingfisher.

Commonly found where trees overhang water.

Upupa epops. Hoopoe.

An occasional visitor to compounds and lawns. Seen in January, March, April, November and December.

Cypsiurus parvus. Palm Swift.

A common nesting bird during the months April—July.

Bubo coromandus. Dusky Eagle-Owl.

Apparently resident and inhabiting shady ravines behind bungalow. At night would often perch in a Blue Gum tree in garden.

Athene brama. Spotted Owlet.

Common resident.

Sarcogyps calvus. King Vulture.

Fairly common. Nesting in November and December.

Gyps indicus. Long-billed Vulture.

Less common than the next species.

Pseudogyps bengalensis. White-backed Vulture.

The common vulture of Chittagong.

Haematornis cheela. Crested Serpent-Eagle.

A common resident. Young birds seen in September and October.

Ichthyophaga ichthyaëtus. Large Grey-headed Fishing Eagle.

Fairly common in flooded areas during monsoon.

Haliastur indus. Brahminy Kite.

Common.

Milvus migrans. Pariah Kite.

Very Common.

Falco tinnunculus. Kestrel.

Seen once on 19—5—45.

Crocopus phoenicopterus. Common Green Pigeon.

Fairly common. Seen in most months of the year feeding on various kinds of Ficus.

Columba livia. Blue Rock Pigeon.

Fairly common.

Streptopelia chinensis. Spotted Dove.

Very common.

S. decaocto. Indian Ring Dove.

Not common. Seen in the months May—July and October and November.

Gallus gallus. Red Junglefowl.

Heard crowing in forest round Foy reservoir.

Amaurornis phoenicurus. White-breasted Waterhen.

Seen once near the railway line some 40 miles North of Chittagong.

Metopidius indicus. Bronze-winged Jacana.

Found on pools in which water-lilies grew.

Larus brunnicephalus. Brown-headed Gull.

Flights of 20–30 passed over bungalow in April and May.

Sterna aurantia. Common River Tern.

Seen on rivers north of Chittagong, but have no record from Chittagong itself.

Phalacrocorax niger. Little Cormorant.

Seen on Foy reservoir.

Anhinga melanogaster. Indian Darter.
Seen on Foy reservoir.

Xenorhynchus asiaticus. Black-necked Stork.
Saw 2 large flocks travelling north, flying high, on 18-5-45 and on 1-6-45.

Leptoptilos (?). Adjutant Stork.
Only once seen on Foy reservoir.

Egretta (?). Egret.
Only saw these at a distance and generally from moving trains and am not sure of identification, but am fairly certain the one which was very common in paddy-fields was *E. garzetta*, the Little Egret.

Ardeola grayi. Paddy Bird.
Common.

Ixobrychus cinnamomeus. Chestnut Bittern.
Seen once on Foy reservoir.

Podiceps ruficollis. Little Grebe.
Fairly common on the larger expanses of water.

BUTTERFLIES OF SOUTH BIHAR

BY

MAJOR P. W. MORRISON-GODFREY, A.M.I.C.E.

(*With a map*)

Bihar is a Province that may be conveniently divided into two distinct collecting subdivisions, North Bihar and South Bihar. The Ganges River passing through Bihar, may be accepted as the border between them.

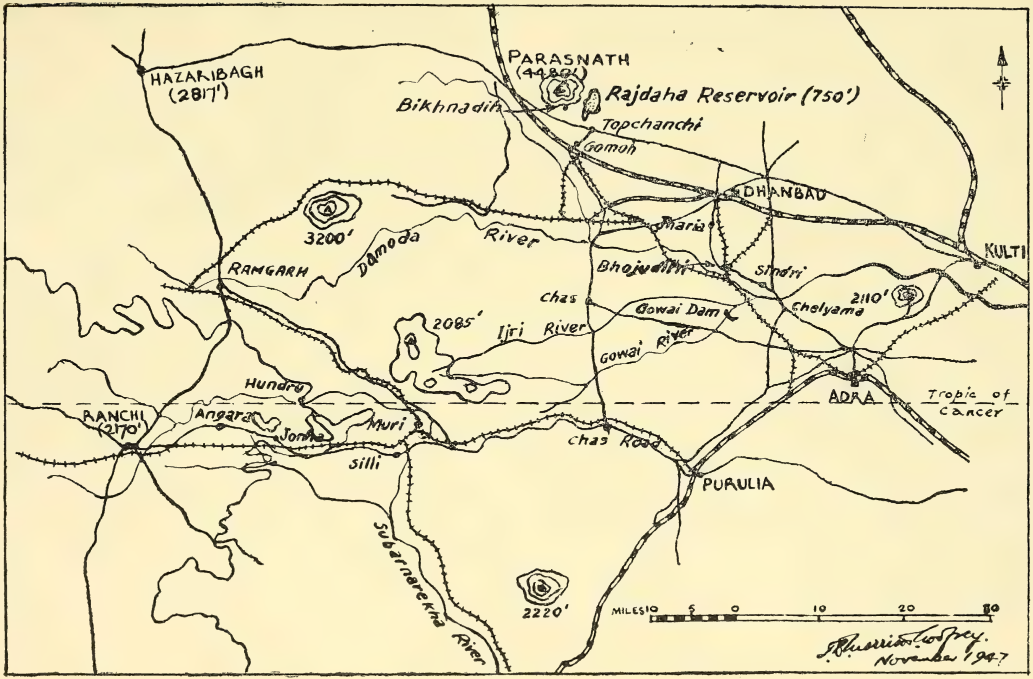
This list covers South Bihar, and includes the districts of Patna, Ranchi, Hazaribagh, and Manbhum.

In South Bihar, the localities are very much restricted, in fact, the place where the largest number of species will be taken is in the jungles surrounding Rajdaha Reservoir, in the district of Manbhum.

Rajdaha Reservoir is an artificial lake formed by the construction of a dam, 950 feet long, across the mouth of a valley in the Parashnath Hills; the lake is 750 feet above sea level, and is 20 miles from Dhanbad on the Grand Trunk Road. Rajdaha Reservoir is commonly referred to as 'Topchanchi' in the District. Topchanchi is the name of a village on the Grand Trunk Road, and the reservoir is about a mile from this place.

It will be interesting to note that although the altitudes in South Bihar range from approximately 200 feet to about 2000 feet, the species listed here are all available at an altitude of approximately 750 feet above sea level.

I have also visited the remote areas up the Domodar, Gowri, and Ijri Rivers, but the species to be found along the valleys are usually of the commoner kinds, although I have come across *Charaxes polyxena imna* But. on several occasions in these valleys.


HAZARIBAGH (2817')
PARASNATH (4480')
Rajdaha Reservoir (750')
Bikhnadih
Topchanchi
Gomoh
DHANBAD
KULTI
3200'
RAMGARH
Damoda River
Maria
Bhojudih
Sindri
Chas
Gowai Dam
2110'
Chelyama
2085'
Ijri River
Gowai River
ADRA
Tropic of Cancer
Hundru
RANCHI (2170')
Angara
Jonha
Muri
Silli
Chas Road
PURULIA
Subarnarekha River
2220'
MILES 10 5 0 10 20 30
November 1947

RANCHI-HAZARIBAGH-MANBHUM DISTRICTS

Note.—The area covered by the list is east of the line Purulia-Adra-Kulti

Other localities that may be given a further trial are those in the vicinity of the Johna and Hundru Falls, both of which are within 50 miles of Ranchi. Unfortunately I was not able to make frequent visits to these falls, but they should prove to be good collecting grounds. Of all the places I was able to visit in South Bihar, I found Rajdaha Reservoir area to be the best, and I therefore decided to concentrate on this locality.

Many different kinds of butterflies can be taken between Parashnath peak (4480 feet) and Rajdaha Reservoir. This list has been prepared from the bulk of the species caught in this locality.

It is of interest to mention that *Nacaduba dana* deN. *Pantoporia selenophora kanara* Evans, and *Halpe moorei moorei* Watson, to my knowledge have never been recorded in this part of India at all.

The area around Rajdaha Reservoir is surrounded by jungle. It is humid, has open spaces combined with shrub jungle, watercourses and streams. Practically every species of butterfly to be taken in South Bihar is likely to be found in this locality.

The best season for collecting in South Bihar, at the localities I have mentioned, is undoubtedly from the commencement of the rains (mid-June) to November, the best month being September. I do not necessarily mean that all the species will be taken in the month of September when I say this is the best month, because *Cyrestis* does not appear until the end of October, and *Neptis* in November, but the majority of the species can be taken in September. February to April are not good months for collecting in South Bihar.

For identification purposes, I have used Evans's letters and figures as from his book 'Identification of Indian Butterflies'.

I am indebted to my friend M. A. Wynter-Blyth, M.A. (Cantab)., for the assistance he has given me in checking specimens with the list I have prepared.

PAPILIONIDAE

1. (A2.9) *Tros hector* L.

2. (A2.10β) *Tros aristolochiæ aristolochiæ* F.
Aristolochiæ may be taken in most places in the province throughout the year. Particularly common during the rainy season.

3. v. *diphilus* Esp.
Common in the vicinity of the Domodar River.

4 (A2.10δ) *Tros aristolochiæ sawi* Nov.[1]
Fairly common.

5. (A3.5β) *Chilasa clytia clytia* L.
Not a common butterfly. I have only seen and caught it at Rajdaha Reservoir in August.

6. v. *dissimilis* L.
Not common, appears in August.

7. (A4.1β) *Papilio polymnestor polymnestor* Cr.
Not common, caught Rajdaha Reservoir 28-4-1947.

8. (A4.25) *Papilio polytes romulus* Cr.
The ♀ form with white bands UPF is distinctly rare.

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[1] As this is a local race peculiar to Car Nicobar, M. A. Wynter-Blyth considers its occurrence here *most* improbable.—EDS.

9. ♀ v. *cyrus* F.

10. ♀ v. *stichius* Hub.

Polytes is common and may be taken in jungle districts of the province.

Cyrus is not common.

Stichius is distinctly rare. I have only seen and caught one, and that was in the month of September.

11. (A4.27) *Papilio demoleus demoleus* L.

Very common over the whole province and can be taken throughout the year.

12. (A5.4) *Pathysa nomius nomius* Esp.

Common during the months of June and July. Fond of settling on damp patches of ground after a shower of rain, particularly on the waterbound macadam road round Rajdaha Reservoir. On 3-8-47 at Rajdaha Reservoir I only came across two and caught them both together, one was an aberration, and almost identical to the aberration caught in the Nilgris by M. A. Wynter-Blyth. (See vol. xliv, No. 4, August 1944, pp. 538 and 601.)

Description of mine.

'Upperside of forewing, 4th band missing, small faint spot above subcostal vein in place of missing band. Band 2 in cell narrow and faint. Upperside hindwing two bands narrow. Rest markings similar to aberration described by Wynter-Blyth. Expanse 66 mm.'

13. (A6.3β) *Zetides doson eleius* Fr.

Not common, may be taken in jungle flying along narrow waterbound macadam roads particularly after a shower of rain. I have come across this butterfly in the month of September.

14. (A 6.8β) *Zetides agemmemnon agemmemnon* L.

A distinctly rare species.

PIERIDAE.

15. (B 1.β) *Leptosia nina nina* F.

Very common in thick jungle, but are rather inclined to be smaller than usual. Available throughout most of the year.

16. (B2.2α) *Huphina nerissa evagete* Cr.

Common over the whole province.

17. (B10.6β) *Appias albina darada* Fd.

Very common most of the year.

18. ♀ v. *semiflava* Fr.

19. (B11.1) *Catopsilia crocale* Cr.

20. (B11.2) *Catopsilia pomona* F.

21. ♀ v. *catilla* Cr.

22. (B11.4) *Catopsilia pyranthe minna* Herbst.

23. (B11.5) *Catopsilia florella gnoma* F.

All are common except v. *catilla and florella*. The commoner ones appear in abundance during the rains.

24. (B15.1) *Terias libythea* F.

Abundant all over the province.

25. (B15.2α) *Terias laeta laeta* Bdv.

Very common particularly around Rajdaha Reservoir.

26. (A15.4α) *Terias blanda silhetana* Wall.

27. (B15.5α) *Terias hecabe simulata* M.

28. (B15.5y) *Terias hecabe hecabe* L.

29. (B20.3) *Parenonia valeria hippia* F.

This insect only appeared in late September, and was common; obviously a new brood because all specimens were very fresh. The male is rare.

30. (C2.9) *Danais limniace mutina* Fruh.
Common before and after the rains.

31. (C2.12) *Danais plexippus* L.
Common before and after the rains.

32. (C2.15) *Danais chrysippus* L.
Common throughout the Province.

SATYRIDAE

33. (D2. 9α) *Mycalesis perseus typhlus* Fruh.

34. (D2.10α) *Mycalesis mineus polydecta* Cr.

35. (D2.12α) *Mycalesis visala visala* M.
These species are all common in jungle, I have also seen *perseus* many miles from jungle.
visala is not common.

36. (D3.21) *Lethe europa ragalva* Fruh.
Rajdaha Reservoir, 29-8-47.

37. (D3.22α) *Lethe rohria nilgiriensis* Guer.
Not common, difficult to find, habitat jungle.

38. (D14.10) *Ypthima ceylonica* Hew.
Rajdaha Reservoir, 9-11-47. Fairly common.

39. (D14.11β) *Ypthima hubneri hubneri* Kirby.
Muri, 31-10-47. Fairly common.

40. (D16.β) *Orsotrioena medus medus* F.
Not common.

41. (D22.1) *Melantis leda ismene* Cr.
Very common in thick jungle.

NYMPHALIDAE

42. (F1.2β) *Charaxes polyxera imna* But.
Only to be seen in thick jungle, flies very fast and extremely difficult to catch. I caught two in the jungles at Rajdaha Reservoir, one on 31-8-47 and one on 21-9-47. They will be seen on the Ranchi Muri Ghat at lower elevations, in June to September. This butterfly is distinctly rare.

43. (F1.2δ) *Charaxes polyxera hierax* Fd.
I had difficulty in classifying the correct race of this butterfly, on account of the area being on the border line between Peninsular India and the N.-E. India area. I was also not able to send the specimen to my friend M. A. Wynter-Blyth for checking. I have since discussed this insect with Brigadier Evans in London, and he informs me that it is *hierax*.

This butterfly is not rare at Rajdaha Reservoir, and I have seen it on several occasions in jungle districts. It is to be found mostly on damp sand. Bear droppings are certain bait. I caught six within an hour on 27-6-47 at Rajdaha Reservoir, another three on 3-8-47. Also seen on 22-8, 24-8, 14-9, 21-9, 12-10, 19-10, 9-11-1947. A very fast flier and unlikely to be taken in flight.

44. (F2. 2γ) *Eriboea athamas athamas* Db.
Not common, found on river beds and damp sand. Rajdaha Reservoir, 28-9-47. Observed between June–September.

45. (F18. 14γ) *Euthalia garuda anagama* Fruh.
Very rare, first observed at Rajdaha Reservoir, on 9-11-47.

46. (F18. 28) *Euthalia nais* Forst.
A very common butterfly in Bihar, found on the plains and in thick jungle. Flies low, easy to catch.

47. (F24. 7γ) *Limenitis procris procris* Cr.
Fairly common, to be found along river beds and likes settling on damp sand. Appears after the rains.

48. (F25. 4*a*) *Pantoporia selenophora kanara* Evans.
Not common, appears in October.

49. (F25. 14) *Pantoporia perius* L.
Rajdaha Reservoir on 26-10-47. Rare.

50. (F26. 1β) *Neptis columella ophiana* M.
Caught on 5-10-47, 12-10-47, 26-10-47. Rare.

51. (F26. 2β) *Neptis jumbah jumbah* M.
Rare, appears after the rains.

52. (F26. 6*a*) *Neptis hylas varmona* M.
Common.

53. (F26. 7β) *Neptis soma soma* M.
Rajdaha Reservoir, 2-11-47. A common butterfly, may be taken in hilly jungle districts on the lower altitudes.

54. (F26. 32β) *Neptis hordonia hordonia* Stoll.
Rajdaha Reservoir, 19-10-47, 2-11-47. Not common.

55. (F27. 2α) *Cyrestis cocles cocles* F.
Not common ; appears in October.

56. (F27. 4α) *Cyrestis thyodamas indica* Evans.
Not common.

57. (F30. 1) *Hypolimnas misippus* L.
♀ common everywhere.
♂ not common.

58. (F30.2) *Hypolimnas bolina* L.
Both male and female common, particularly the female. Rajdaha Reservoir locality is best for this butterfly.

59. (F34.2β) *Kallima inachus inachus* Bdv.
I have only seen it at Rajdaha Reservoir during the months of September, October and November, and it is then common. For information to the collector ; it will be taken at a place in the jungle, north side of jungle track between Rajdaha Reservoir and Bhikhnadih village, about a quarter of a mile from the reservoir. Fond of settling on trunks of trees.

60. (F35.1a) *Precis hierta hierta* F.

61. (F35.2a) *Precis orithya swinhoei* But.

62. (F35.3*a*) *Precis lemonias vaisya* Fruh.

63. (F35.4) *Precis almana almana* L.

64. (F35.5) *Precis atlites* L.

65. (F35.6γ) *Precis iphita iphita* Cr.
All are common except 'iphita'. The best month being June. Rajdaha Reservoir is a particularly good place for all the species.

66. (F36.1) *Vanessa cardui*, L.
Rare.

67. (F42.1) *Atella phalanta* Drury.
Very common, may be taken in most places.

68. (F49.1β) *Ergolis ariadne inidica* M.
Common in September at Rajdaha Reservoir, is not common elsewhere in the Province.

69. (F52) *Telchinia violae* Feb.
Very common, particularly on the plains after the monsoon. It was late in appearing at Rajdaha Reservoir. Brood generally over by mid-October, a few may be seen after October.

ERYCINIDAE

70. (G4.5β) *Abisara echerius suffusa* M.
The only Erycinidae in Bihar, and is fairly common. To be found only in thick jungle. It is common at Johna Falls. July to September best months.

71. (H11.1) *Castalius rosimon rosimon* F.
Common at Rajdaha Reservoir.

72. (H11.2β) *Castalius caleta decidia* Hew.
Rare, only appeared in October.

73. (H12.4) *Tarucus callinara* But.
A most difficult genus to identify, some of those caught were marked like *nigra* above and *callinara* below.

74. (H12.5) *Tarucus theophrastus indica* Nov.
Not common, may be taken at Ranchi.

75. (H12.6) *Tarucus extricatus* But.
Appeared common on 3-8-47 at Rajdaha Reservoir.

76. (H12.8) *Tarucus nigra* BB.
Common at Rajdaha Reservoir in August.

77. (H12.9) *Tarucus nara* Koll.
See remark against *callinara*. Those resembling *callinara*, *nara*, *extricatus* and *nigra* are very common butterflies at Rajdaha Reservoir during the months of July, August and September.

78. (H13) *Syntarucus plinius* F.
Difficult to find. May be taken in August.

79. (H21.2β) *Lycaenopsis puspa gisca* Fruh.
A rare butterfly in this Province, one specimen caught at Angara P.W.D. Inspection Bungalow, Ranchi-Muri Road, on 19-8-47. One caught on the following dates, 21-9-47 and 28-9-47, at Rajdaha Reservoir.

80. (H23.a) *Chilades laius laius* Cr.
Not common, available at Rajdaha Reservoir in August.

81. (H24.1a) *Zizeeria trochilus putli* Koll.
Very common along the banks of the Domodar River away from trees ; appears in abundance after the commencement of the rains. It is then to be seen for about a month, but afterwards only occasionally.

82. (H24.3β) *Zizeeria maha maha* Koll.

83. (H24.4) *Zizeeria lysimon* Hub.

84. (H24.5) *Zizeeria gaika* Trimen.
All common, along the banks of the Domodar River, south of Dhanbad.

85. (H24. 6a) *Zizeeria otis decreta* But
Very common after the commencement of the rains; prefers to fly above new grass.

86. (H25.1) *Euchrysops cnejus* F.
12th October, 1947.

87. (H25.3β) *Euchrysops pandava pandava* Hors.

88. (H26.1a) *Lycaenestes emolus emolus* God.

89. (H26.2a) *Lycaenesthes lycaenina lycaenina* Fd.
Not common ; caught in August.

90. (H27.1) *Catachrysops strabo* F.
Rather a rare butterfly, not easy to find.

91. (H28) *Lampides boeticus* L.
Uncommon, to be found at Rajdaha Reservoir.

92. (H29.5β) *Jamides celeno celeno* Cr.

93. (H29.9β) *Jamides alecto eurysaces.* Fruh.
Available in hilly districts of South Bihar, flies in September.

94. (H32.15) *Nacaduba nora nora* Fd.

95. (H32.16a) *Nacaduba dubiosa indica* Evans.

96. (H32.19) *Nacaduba dana* deN.
Nacadubas are not common in South Bihar. The best place where they may be taken is at Rajdaha Reservoir.

97. (H44.6) *Curetis acuta dentata* M.
Quite a common butterfly. It is to be found in most jungle districts of South Bihar, and easily aroused when resting. I have both the male and female; the male is common and the female is rare. Best months, August and September.

98. (H45.1.Y) *Iraota timoleon timoleon* Stoll.

99. (H46.1β) *Horsfieldia anita dina.* Fruh.
This butterfly is not rare, it will be taken at Rajdaha Reservoir from the commencement of the monsoon to the end of September.

100. (H49.34) *Amblypodia alemon* deN.
I have a female caught on 31-8-47. I have not seen another since, but should say not rare.

101. (H49.39a) *Amblypodia amantes amantes* Hew.
Not rare, I have taken it at Rajdaha Reservoir and at Ranchi. I have also seen it during the months of July, August and September. Settles on the leaves of trees—high up.

102. **(H50.1β)** *Surendra quercetorum biplagiata* But.
Female very common from June to November. I have not seen the male.

103. (H53.Y) *Loxura atymnus continentalis* Fruh.
This species is very common; will be taken between June and November.

104. (H57.1β) *Spindasis vulcanus vulcanus* F.

105. (H57.6β) *Spindasis ictis ictis* Hew.

106. (H57.7β) *Spindasis elima elima* M.

107. (H57.12) *Spindasis syama peguanus* M.
Vulcanus is common. I have taken it at Johna Falls, Rajdaha Reservoir and on the Domodar River, south of Dhanbad. I have also seen it in the Hazaribagh district. *Syama* is not common, *ictis* is rare.

108. (H58) *Zesius chrysomallus* Hub.
Not common, available in October.

109. (H60.18) *Tajuria jehana* M.
Rare.

110. (H60.19β) *Tajuria cippus cippus* F.
Rare. Caught at Rajdaha Reservoir on 10-8-47.

111. (76) *Rathinda amor* F.
Rare.

112. (H83.1a) *Deudoryx epijarbas epijarbas* M.

113. (H85.11α) *Rapala varuna lazuliua* M.

114. (H85.12) *Rapala schistacea* M.

115. (H85.16) *Rapala melampus* Cr.
These insects are rare. They may be taken in July and August. I have not seen them at any other time. Rajdaha Reservoir is the best place.

HESPERIDÆ

116. (I.5.) *Badamia exclamationis* Fab.
I caught a male on 22-8-47 and a female on 14-9-47.

117. (114.10β) *Tagiades litigiosa litigiosa* Mosch.
Not common, will be taken July-September.

118. (I.19.6a) *Daimio bhagava bhagava* M.
Not common, available after August.

119. (I20.2β) *Coladenia indrani indra* Evans.
Not a common species.

120. (I26.1α) *Caprona ransonnettii ransonnetti* Fd.
Very common at Rajdaha Reservoir, appears in July, August, September and October.

121. (126.1.Y) *Caprona ransonnetti taylorii* deN.
Second dry season form, appears before July.

122. (126.2a) *Caprona agama pelias* Fruh.
I have only one specimen caught on 24-7-47. This butterfly is rare.

123. (I28.2) *Syrichtus galba* F.
Not common.

124. (I57.1) *Udaspes folus* Cr.
Not common, available in September.

125. (I64.1) *Matapa aria* M.
Not rare, available in September.

126. (I83.31) *Halpe moorei moorei* Watson.

127. (I87) *Cupitha purreea purreea* M.
Rare, only one specimen, July, 1947.

128. (I91.2β) *Astyeus pythias bambusae* M.
Will be taken on the plains in July.

129. (I97.1β) *Baoris oceia farri* M.
Common, best month September.

130. (J97.24a) *Baoris conjuncta narooa* M.
Rare—I have two, one caught on 24-8-47, and the other on 14-9-47, at Rajdaha Reservoir.

131. (197.30a) *Boaris sinensis subochracea* M.
Not rare, to be taken in September.

132. (I97.31β) *Boaris mathias mathias* F.
Uncommon, September is the best month.

133. (I97.32β) *Boaris guttatus bada* M.
Rather rare, I have caught it on the Ghats between Ranchi and Muri in August, and at Rajdaha Reservoir in September.

134. (197.33β) *Boaris zelleri cinnara* Wallace.
I have caught this butterfly on the banks of the Domodar River, in Manbhum District in July, and at Rajdaha Reservoir in September.

NOTES ON THE SOLANACEAE OF BOMBAY.

BY

H. SANTAPAU, S.J., F.L.S.

The *Solanaceae* of India have been left practically unchanged from the time Clarke published his *Solanaceae* in Hook. f. *Flora of British India* in 1883; the authors of most of the local floras published since that time have confined themselves to copying Clarke's notes and descriptions almost without any alteration. Much work has been and is being done, especially in America, on the more important commercial plants of the Family. I shall try and introduce into these notes the results of my studies in the library and herbarium at Kew Gardens with the hope that they will be of help to other Indian botanists.

The most important changes in the Family concern the splitting of the genus *Solanum* into *Solanum* and *Lycianthes*, the identity of the Indian species of *Datura*, and a few other points in nomenclature. A comprehensive list of references is given at the end of this paper embodying the more important contributions on the Family; papers dealing exclusively with the cytology of the Family or of some of the genera have been purposely omitted.

SOLANUM Linn.

KEY TO THE SPECIES OF SOLANUM OF BOMBAY.

Unarmed plants:
  An annual herb; flowers white, in umbellate, pedunculate cymes ... *S. nigrum.*
  Shrubs or undershrubs or small trees:
    Large shrub or small tree with white flowers in corymbose cymes ... *S. verbascifolium.*
  Small shrub with purple flowers in racemose cymes ... *S. pubescens.*
Armed with prickles.
  Herbs.
    Leaves 15 cm. or more long; berry 2.5-4.5 cm. diam. clothed all over with long hairs ... *S. ferox.*
    Leaves under 12 cm. long; berry glabrous, about 2 cm. diam., yellow or creamy or pale green with deep green veins:
      Prostrate or procumbent plant, densely stellate hairy at least when young ... *S. xanthocarpum.*
    Erect or suberect plant, glabrous or nearly so ... *S. McCannii.*
  Shrubs or undershrubs.
    Leaves entire, not prickly, 15-25 cm. long, under 6 cm. broad ... *S. giganteum.*
    Leaves irregularly toothed or lobed, prickly on the main nerves, over 5 cm. long berry about 8 mm. diam.; erect shrub ... *S. indicum.*
    Leaves under 5 cm. long; trailing or subscandent shrub or undershrub ... *S. trilobatum.*

1. **Solanum nigrum** Linn., Sp. Pl., 186, 1753; Dunal, in D. C. Prodr. 50; Clarke, 229; Cooke, 263; Schultz, 160; Gamble, 936; Merrill, 426.

Solanum rubrum Mill., Gard. Dict. (ed. 8), No. 4, 1768; Wight, Icon. t. 344.

Solanum incertum Dunal, Hist. Solan., 155; Graham, 137.

At first sight, this plant may be confused with *Lycianthes bigeminata* (Nees) Bitt. (*Solanum bigeminatum* Nees); but the type of inflorescence at once distinguishes these two species: *Solanum nigrum* has white flowers in umbellate, long-peduncled cymes; whilst the other species has purple flowers in lateral fascicles.

2. **Solanum verbascifolium** Linn., Sp. Pl., 184, 1753; Dun., 114; Wight, Icon. t. 1398; Clarke, 230; Cooke, 263; Schultz, 182; Gamble, 936; Merrill, 429.

Solanum pubescens Roxb., Fl. Ind., 2: 244, 1824 (non Willd.)

Solanum verbascifolium var. *exstipulatum* O. Kuntze, Rev. Gen. Pl. 2: 455, 1891.

A large shrub or small tree, remarkably similar to *Callicarpa lanata* Linn. in general appearance; but it can be easily distinguished by its white flowers.

3. **Solanum pubescens** Willd., Phytogr., 5, 1794; Wight, Icon. t. 1402; Clarke, 230; Cooke, 263; Gamble, 936 (non Roxb.)

In many respects this plant is somewhat similar to *S. verbascifolium* Linn., from which it may be distinguished by its purple flowers in racemose cymes.

4. **Solanum ferox** Linn., Sp Pl. (ed. 2), 267, 1762; Graham, 139; Wight, Icon. t. 1399; Clarke, 233; Cooke, 265; Gamble, 937; Merrill, 426.

One of the most typically distinct Solanums of Bombay; leaves about the largest of the genus in Western India, reaching 35 cm. long and up to 30 cm. broad; stems and branches densely velvety tomentose with erect or spreading tomentum, armed with a few, very fine, sharp yellow prickles, which are irregularly scattered among the tomentum. Most typical of this species however is the densely hairy fruit; this is the only hairy or tomentose fruit for the genus seen at Kew Herb. for the whole of India. It is also one of the largest-fruited wild Solanums.

5. **Solanum xanthocarpum** Schrad. & Wendl., Sert. 1: 8, t. 2, 1795; Clarke, 236; Cooke, 265; Gamble, 938.

Solanum Jacquini Willd., Sp. Pl. 1: 1041, 1798; Roxb., Fl. Ind. 1: 569, 1832; Graham, 139.

Solanum diffusum Roxb., loc. cit. p. 568.

About the most densely armed of the Bombay Solanums; prostrate or procumbent, or at times suberect, but I have not observed it creeping and rooting at the nodes. Common everywhere in roadsides and waste places. At times it is a somewhat gregarious plant, and when growing in overcrowded conditions, it becomes erect or suberect.

6. **Solanum giganteum** Jacq., Collect. 4: 125, 1790; Graham, 138; Wight, Icon. t. 893; Dalz. & Gibs., 175; Clarke, 233; Cooke, 266; Gamble, 937.

A large shrub, easily distinguished by its leaves which are long and relatively narrow, dark green and glabrous above, white velvety tomentose beneath. Spines or prickles are short, stout, yellowish or orange in colour and hairy at the base. It is found only on the highest hills of the Province of Bombay.

7. **Solanum indicum** Linn., Sp. Pl., 187, 1753 pro max. parte; Graham, 138; Wight, Icon. t. 346; Dalz. & Gibs., 174; Clarke, 234; Cooke, 266; Gamble, 938; Merrill, 426.

Examination of large numbers of sheets from all over India at Kew Herb. has shown that this is one of the most variable of the Solanums of India. Dry season plants when compared with others growing under better conditions of moisture are almost unrecognizable as belonging to the same species. Prickles vary from very numerous all over the plant to just a few on the upper and younger parts; the degree of pubescence is also very variable. Probably some good varieties could be made of this species, but in view of the great variability of the plant, I have found it very difficult to set the limits between neighbouring varieties, and in consequence have left the species as it has stood up to the present.

8. **Solanum trilobatum** Linn., Sp. Pl. 188, 1753; Graham, 138; Dunal, 287; Wight, Icon. t. 854; Dalz. & Gibs., 175; Clarke, 236; Cooke, 267; Gamble, 938.

Generally a scandent or subscandent plant; prickles hooked; leaves about the smallest among the Bombay Solanums, often 3-lobed, petioles fairly long and slender.

9. **Solanum McCannii** Santapau sp. nov.

Species haec distincta satis videtur, proximeque ad *Solanum xanthocarpum* Schrad. & Wendl. accedit, a quo tamen differt sequentibus notis: habitu erecto vel suberecto, longis internodalibus spatiis; caulibus ramisque lignosis vel sublignosis, non vero herbaceis; ramis acute quadrangularibus, haud striatis; aculeis rarioribus, minoribusque; petiolis longioribus; corollis largioribus, calycibus vero minoribus; pedicellis longioribus atque fortioribus; fructibus eiusdem fere vel paulo maioris magnitudinis; pubescentia multo sparsiore. His omnibus notis fit ut nova haec species primo intuitu diversa appareat a coeteris speciebus quae ex occidentalibus partibus Indiae sunt hucusque descriptae.

This is a clearly distinct species approaching *S. xanthocarpum* Schrad. & Wendl., but differing mainly in the following particulars: its erect or suberect habit, with fairly long internodes; stem and branches woody or subwoody, not herbaceous; branches sharply angular and either not at all or only very faintly striate; prickles not so dense as and generally smaller than in *S. xanthocarpum;* petioles longer; corollas larger, calyx smaller; pedicels both in flower and fruit longer and stouter; fruit of about the same size or slightly larger; the whole plant distinctly much less pubescent.

Erect or suberect, up to 40 cm. high, not prostrate nor procumbent, with woody base, woody or subwoody branches and fairly long internodes; young branches with an occasional stellate hair, older ones glabrous or nearly so, all more or less sharply angular, at times almost 4-winged; prickles compressed, straight, yellow or straw coloured from a fairly broad base, erect or spreading, and very sharp, more numerous and large in the upper than in the lower parts of the plant.

Leaves up to 9×6 cm., ovate or elliptic in outline, sinuate or subpinnatifid, acute or subacute, very sparsely hairy on both sides with an occasional stellate hair, at length glabrous or nearly so, armed on the midrib and some of the lateral nerves with sharp yellow prickles on both sides; prickles up to 9 mm. long; base of the leaf very unequal-sided, truncate or cuneate; petioles up to 3.5 cm. long, glabrous or nearly so, armed with stouter prickles than the rest of the leaf, and decurrent along the stems.

Flowers in extra-axillary racemose cymes, the axis of the cyme up to 7 cm. long; pedicels in flower up to 10 mm. long, and erect, elongating to 15 mm. and becoming curved and at times reflexed and stouter upwards in fruit; axis of the inflorescence and pedicels prickly. Calyx up to 7 mm. long, tube about a quarter of the length of the whole calyx; lobes acute, deltoid, sparsely stellately hairy in flower, glabrous in fruit, densely prickly outside with prickles of 2-6 mm. in length. Corolla bluish purple, up to 2.7 cm. diam., lobes deltoid, up to 9 mm. long, densely stellately hairy outside, stellately hairy but not so densely inside. Filaments very short, glabrous; anthers bright yellow, glabrous, slightly curved, up to 9 mm. long, opening by small apical pores facing upwards. Ovary and style glabrous; berry at first green, then pale green with deeper green veins, at length yellow, up to 2 cm. diam. Seeds 3 mm. diam., compressed, glabrous.

The type of this plant, Santapau 2972-2973, was collected in Khandala on the 18th October 1943. I wish to dedicate this species to my good friend Charles McCann, Esq., F.L.S., Joint Curator, Bombay Natural History Society, who has very often accompanied me in my excursions through Khandala.

10. **Solanum torvum** Swartz, Prodr., 47, 1788; id. in Flor. 1: 456; Dun., Hist. Solance. 203, t. 23; Wight, Icon. t. 345; Dalz. & Gibs., 175; Clarke, 234; Cooke, 269; Gamble, 937; Merrill, 426.

Solanum indicum Linn., Sp. Pl. 187, 1753, pro parte.

Solanum stramonifolium Roxb., Fl. Ind., 1: 572, 1832 (non Jacq.)

Among the many sheets of the species in Kew Herb., there is none from Bombay; Dalz. & Gibs., loc. cit., are the only authorities for the inclusion of this among the plants of Bombay.

11. **Solanum tuberosum** Linn., Sp. Pl. 185, 1753; Graham, 137, Dunal, 31: Dalz. & Gibs. Suppl., 60; Clarke, 229; Cooke, 269; Schultz, 248; Gamble, 938; Merrill, 426.

The Potato plant, extensively cultivated in Western India. In some districts the greatest enemies of the potato seem to be the village children who eat the tubers raw and apparently with relish. In Khandala I heard some Katkari children speaking of the 'Sweets' growing freely in the fields; they showed me some of their 'sweets' which proved to be some potato tubers from a neighbouring field.

12. **Solanum melongena** Linn., Sp. Pl. 186, 1753: Nees in Trans. Linn. Soc. 17: 48; Graham, 138; Dalz. & Gibs., Suppl., 61; Wettstein in Engler & Prantl, Pflanzenfam. 4, (3B): 23, f. 11 N; Cooke, 269; Schultz, 213; Gamble, 937; Merrill, 426.

Solanum esculentum Dunal, Hist. Solanac., 208.

The Brinjal or Egg-Plant, widely cultivated in fields and in flower pots in Western India.

LYCIANTHES (Dunn.) Hassl.

Lycianthes (Dun.) Hassl. in Ann. Cons. Jard. Bot. Geneve 20: 173-183, 1917, sesu ampl. Bitt. in Abhandl. Naturw. Ver. Bremen, 24: 292, 1920. *Solanum* sect. *Pachystemonum*, subs. *Lycianthes* Dun. in DC. Prodr. 13(1): 29, 156, 1852 pro max. parte. *Solanum* sect. *Lycianthes* (Dun.) Wettstein in Engl. Prantl, Pflazenfam. 4, 3B: 22, 1891.

The following is the translation of the generic characters taken from Bitter, loc. cit.: 'Inflorescences sessile in the axils of the upper leaves (which are falsely geminate), often few-flowered; calyx shortly campanulate, truncate, mostly 10-toothed (lobes unequal alternatively subulate-linear), or rarely 5-toothed, the calyx often being cupulate or entirely destitute of teeth; corolla rotate or stellate; filaments at times almost equal, at other times more or less unequal in length, one or three being longer than the rest, all glabrous; anthers mostly ellipsoid, at times abbreviated, more often fairly long, nearly always opening inwards by apical oblique pores; style glabrous. Shrubs or undershrubs, more rarely herbs creeping and rooting at the nodes or below the nodes; leaves always simple, mostly entire, the higher ones falsely geminate, unequal.'

Bitter based his description on that of Hassler; but whereas the latter only recognized three South American species as belonging to the new genus, Bitter so enlarged it that over 100 species are now contained under *Lycianthes* Hassl. ampl. Bitt.

The type of fruit is the main foundation for the new genus according to Hassler. 'Most of the Solanums possess or do not possess sclerotic nodules, but in no case does one find seeds enveloped in a sclerotic coating. . . . The discovery . . . of fruits with seeds surrounded by a sclerotic pericarpic coating constitutes an extremely interesting finding. . . . The sclerotic coating of the seeds is made up of a very dense shell of sclereides. . . . Under the name of subsect. *Polymeris* Dunal has collected numerous species of the genus Solanum (sect. *Pachystemonum*), which have only the inflorescence in common. . . . The subsect. *Polymeris* (Dun) Bitt. . . . contains those species with a 10 or more-lobed calyx; the section *Polymeris* shows also in its floral structure the greatest affinity with the small group of our three species which Dunal has placed under *Eulycianthes*. . . . The *Eulycianthes* Dun. are the only species of *Solanum* known up the present to be provided with a drupaceous fruit, and on account of this character, clearly differentiated from the neighbouring species of the sect. *Polymeris* (Dun.) Bitt. Among the latter the fruit is that of a typical *Solanum*, that is to say, a berry.' (Hassler, loc. cit. p. 174-180). The basis then of the new genus according to Hassler is the character of the ovary and fruit, '*ovario 8-ovulato, fructu pyrenato*'.

Bitter, on the other hand, seems to pay so little attention to the fruit, that in his generic description he does not even mention it. More emphasis is placed on the nature of the apical pores of the anthers, and on the 10-toothed calyx. The genus thus enlarged by Bitter contains a great variety of types, shrubs, undershrubs, and even creepers, most of them with simple, entire leaves which at times appear fasciculate or subfasciculate on account of the suppression or abortion of the leaf-bearing branches. In the following list of species of *Lycianthes* (Dun) Hassl., sens. ampl. Bitter, I depart somewhat of the original scope of my paper and shall include all the Indian species of *Lycianthes* mentioned by Bitter in his monograph; it is my hope in this manner to do a service to other Indian botanists who have not had access to Bitter's original paper.

1. **Lycianthes bigeminata** (Nees) Bitter, loc. cit. p. 480.
Solanum bigeminatum Nees, in Trans. Linn. Soc. 17: 42, 1837; Dunal, 175; Clarke, 231; Cooke, 264.
Solanum Neesianum Dalz. & Gibs., 175; 1861 (non Wall.)
Solanum laeve Clarke, 231; Gamble, 936 (non Dun.)

For the differences between this species and *Solanum nigrum* Linn. see above under the latter species. The position of the pores on the anthers is quite clear in all the specimens examined in Kew Herb. For the rest, in the dry state it is not easy to determine plants belonging to this species; it may be even difficult at first sight to say whether they belong to the *Solanaceae*, as they have very little which is typical except the anthers and the fruit, and either of these structures or both may be absent from the specimens.

2. **Lycianthes bigeminata** subsp. **Kaitisis** (Dun.) Bitt. loc. cit. p. 481.
Solanum Kaitisis Dun. in DC. Prodr., 13(1): 157, 1852.
Solanum denticulatum C. B. Clarke, 231; Cooke, 264 (non Blume).

3. **Lycianthes lysimachioides** (Wall.) Bitt., 491.
Solanum lysimachioides Wall. Cat. 2609; Wall. in Roxb. Fl. Ind. 2: 257 (excl. syn. *S. biflorum* Lour.)

4. **Lycianthes biflora** (Lour.) Bitt., p. 461.
Solanum biflorum Lour. Fl. Cochinch. 1: 129, 1790, 159, 1793; Dun., Hist. Solanac. 177; Dun. in DC. Prodr., 13(1). 178, 1852; Clarke, 232; Bitt. in Engl. Bot. Jahrb. 55: 90, 1917.
Solanum decemdentatum Roxb., Hort. Beng., 16, 1814; Fl. Ind., 2: 247, 1824; Dun. in DC. Prodr., 13 (1): 179, 1852;
Solanum decemfidum Nees, in Trans. Linn. Soc. 17: 43, 1837.

5. **Lycianthes macrodon** (Wall.) Bitt., 468.
Solanum macrodon Wall., Cat. 2621, 1828; Nees, loc. cit., 43; Dun., 180; Clarke, 232 ex parte (excl. var. *lysimachioides*).

6. **Lycianthes pachypetala** (Spreng.) Bitt., 475.
Solanum crassipetalum Spreng., Syst. 4(2): App., 72, 1827.
Solanum crassipetalum Wall. Cat. 2618, 1828; Wall. in Roxb., Fl. Ind., 2: 256, 1824; Clarke, 232; Nees, loc. cit. 42.

Lycianthes denticulata (Blume) Bitt., and *L. levis* (Dun.) Bitt. do not occur in India. The following key may help to distinguish *Lycianthes* from *Solanum* and other allied genera:

Anthers ellipsoid; pores apical, but facing inwards and often oblique; calyx 10-rarely 5-partite, not seldom truncate without lobes	... *Lycianthes*.
Anthers elongated; apical pores facing upwards or outwards; calyx teeth 5	... *Solanum & al.*

PHYSALIS Linn.

The following key has been adapted from Gamble, Flora of Madras, p. 939:

Corolla 13 mm. diam. or more, with 5 purple spots near the base within; calyx more than 2.5 cms. long, ovoid-conical; leaves ovate, sinuate or angular, usually entire, pubescent, up to 7.5 cm. long, 5 cm. broad; berry orange-yellow	... *P. peruviana*.
Corolla under 7 mm. diam., sometimes spotted; calyx under 2.5 cm. long, ovoid or subglobose; leaves ovate, acute, sinuate or toothed, pubescent or nearly glabrous, up to 6.5 cm. long, 4 cm. broad, berry small, yellow	... *P. minima*.

1. **Physalis minima** Linn., Sp. Pl., 183, 1753; Graham, 140; Clarke, 238; Cooke, 270; Merrill, 423.

Physalis parviflora R.Br., Prodr. 447, 1810.

Physalis pubesones Wight, Illustr. t. 166 b, fig. 6 (non Linn.)

There are two extreme forms of this plant: one is glabrous or nearly so, the other fairly densely pubescent. Specifically it is impossible to separate the two forms, on the grounds of pubescence, as they are connected by a number of intermediate stages. The same may be said of the sizes of the fruit and of the plant itself.

2. **Physalis peruviana** Linn., Sp. Pl. (ed. 2) 1670, 1763; Graham, 140; Dunal, 440; Dalz. & Gibs., Suppl., 61; Clarke, 238; Cooke, 270; Schultz, 149; Merrill, 423.

Physalis edulis Sims., Bot. Mag. t. 1068, 1807.

Physalis pubescens R. Br., Prodr. 1: 447, 1810 (non Linn.)

In herbarium specimens this is very similar to the preceding species. The size of the fruit, however, is sufficient to distinguish the two species. *P. peruviana* has a fruit which together with the persistent, accrescent calyx reaches 4 cm. or more in length, whilst *P. minima* has a fruit scarcely reaching 2.5 cm. long; when observed in nature, there is no difficulty in distinguishing these two species, as *P. peruviana* is a fairly large shrub reaching 2 metres in height, *P. minima* is but a herb scarcely reaching and seldom passing 75 cm. in height.

WITHANIA Pauq.

Withania somnifera (Linn.) Dunal in DC. Prodr. 13(1): 453, 1852; Clarke 239; Cooke, 271.

Physalis somnifera Linn., Sp. Pl. 182, 1753; Graham, 139; Dalz. & Gibs., 175; Wight, Icon. t. 8553.

A typical xerophyte of dry situations; rare in the Province except in Gujerat and in the drier parts of the Deccan. A fine greenish white bloom covers the whole plant; for the rest in general appearance it is somewhat like *Physalis minima*, but flowers and fruits are much more numerous at the nodes and smaller than in *Physalis minima*.

DATURA Linn.

The nomenclature and identity of some of the Daturas of India have been fully discussed lately by Safford, whose main contributions on the subject have been listed in the bibliography at the end of this paper. It is a little surprising that authors of Indian floras published after Safford's papers on the Daturas seem to have taken no notice at all of his changes in nomenclature; Merrill on the other hand, in his Enum. Phil. Fl. Pl., vol. 3, p. 430 accepts Safford's changes; from the synonymy given by Merrill, there is no doubt that he is dealing with a plant identical with our Indian so-called *D. fastuosa*.

1. **Datura Metel** Linn., Sp. Pl. 179, 1753; Fleming in Asiat. Res., 11: 165, 1812 (Lond. edit.); Roxb. Fl. Ind. 1: 561, n 2, 1832; Safford, in Journ. Wash. Acad. Sci. 11 (8); 178-179, 1921; id. in Journ. Hered. 12: 178-190, figs. 10 & 12 (1-2), 1921; id. in Ann. Rep. Smith. Instit. 1920, 541-548, figs. 1-3, 5, Pl. 1, 1922; Merrill, 430.

Datura fastuosa Linn., Syst. Nat. (ed. 10) 2: 932, 1759; Graham, 141; Wight, Icon. t. 1396; Clarke, 242; Cooke 273; Gamble et omn. al. auct. recent. Ind. passim.

Datura alba Nees in Trans. Linn. Soc. 17: 73, 1837; Dunal in DC. Prodr., 13 (1): 541-544, 1852; Wight, Icon. t. 852; Graham, Cat., 141; Dalz. & Gibs., 174.

Datura fastuosa var. alba (Nees) Clarke, 243; Cooke et al. recent.

Dutra alba Rumph., Herb. Amb. 5: 242, tab. 87, 1755.

Flemming and Roxburgh, loc. cit., identify the Dhatura of India as the *Datura Metel* Linn. Hardwicke in Asiat. Res. 6: 351 enumerated *Datura Stramonium* among the plants found at Srinagar, but later he corrected his identification to *D. Metel*, as stated by Flemming, loc. cit. From the time of Nees the true *Datura Metel* Linn. seems to have mysteriously disappeared from India. Without exception, all the local floras consulted give *Datura Metel* Linn. as the name of an American plant, and call the Indian species by one of these names: *D. fastuosa*, *D. alba* or *D. fastuosa* var. *alba*. The following extracts are from Safford's 'Daturas of the Old World and New . . .' in Ann. Rep. Smith. Instit., 1920, pp. 537-567, 1922:

'*Confusion of Specific Names.*—It seems strange that botanists should have abandoned the valid name *Datura Metel* for the Asiatic species, substituting for it *Datura fastuosa*, which was first published as a specific name in the second edition of Species Plantarum, and transferring the name *Datura Metel* to an American plant specifically distinct from the true *Datura Metel* of Linnaeus.

Under the brief description in Hortus Cliffortianus . . . the first two references lead to the identification of the *Stramonia* or *Pomum spinosum* described and figured by Bauhin, with the *Stramonia* of Fuchsius (1542) in the form and surface of the fruit, which bears very short and thick spines not subulate or needle-like prickles; indeed, his second illustration . . . is a reduced copy of Fuchsius's. It was not until after publication of the Hortus Cliffortianus (1737) that Rumphius published his Herbarium Amboynense containing the plate (fig. 3 in Safford's paper). . . Linnaeus is careful to cite this plate, both in the tenth edition of his Systema and the second edition of his Species Plantarum, as an illustration of his *Datura metel.* In the former work he publishes *D. fastuosa* as the name of the second figure on the plate, not as a numbered species, but as a variety B; in the latter work he gives it specific rank, making it differ from the typical *D. metel* in having tuberculate instead of prickly pericarps. Fortunately the figures themselves show that these differences are nominal, and one has only to examine the fruits of the various forms of this East Indian Dhatura to be convinced of the variability of their tubercles or prickles . . . That the white and purple forms of the single or double flowered plants should all be referred to one species by Linnaeus, is justified by the best modern authorities on East Indian botany; but that the name *D. fastuosa* should be adopted for the species and the previously established type (*D. metel*) reduced to a synonym, as in Trimen's Handbook of the Flora of Ceylon, is inexcusable. Still more surprising is the treatment of this species by Nees von Esenbeck, who re-baptized the species *D. alba*, citing as its type the very plate of Rumphius which Linnaeus cites as the typical forms of his *Datura metel;* while C. B. Clarke in Hooker's Flora of British India, not only ignores Linnaeus's reference above mentioned in connection with *Datura metel* but transfers this specific name from the Asiatic metel-nut to a plant of American origin and cites as an illustration of the species not the figures of Fuchsius, Bauhin, or Rumphius, which fix Linnaeus's species, but an illustration in Curtis's Botanical Magazine . . . of a plant grown in London from seed of American origin, clearly identical with Miller's *Datura innoxia*, which will be described below . . .

Botanical Description of the Asiatic Datura Metel. Datura metel L. is a spreading plant with dichotomous branches, usually herbaceous but sometimes becoming shrublike with the base of the stem and the lower branches woody, and the root, which penetrates deeply into the soil, bearing several large branches of similar size. The entire plant is apparently glabrous and has the appearance of being covered with fine grayish dust or flour. The terete glossy stems and older branches are marked with the scars of fallen leaves. The leaves are triangular-ovate in general outline and unequal-sided at the base, especially those of the upper branches acute at the apex, and with the margins usually angulate but sometimes entire. The flowers . . . are large and funnel-shaped, often double or triple, one corolla issuing from another; in the type form pure white, but sometimes of a dirty whitish colour, violaceous, reddish-purple or purple on the outside and white within. The tubular calyx, as seen under the lens, is minutely appressed-pubescent, with five triangular, acuminate, marginal teeth, and is usually one third as long as the corolla. The corolla limb when fully expanded is almost circular, normally with 5 equidistant radiating nerves terminating at the margin in a short acute tail, but often 6-toothed, and in the inner Corollas of double flowers from 5 to 10-toothed. The tubercled or muricate globose fruit . . . is borne on a short thick peduncle which is never erect as in *D. stramonium* . . . but curved to one side, so that the fruit is at length more or less inclined or nodding. The persistent expanded base of the calyx is either reflexed or appressed to the pericarp, which is not valvate, as in *D. stramonium*, but cracks open irregularly, revealing a mass of closely packed, light brown, flat seeds which nearly fill the interior.

Type locality.—As to the mother country of *Datura metel* Linnaeus states in the first edition of his Species Plantarum (p. 179, 1753) "Habitat in Asia, Africa". In Hortus Cliffortianus, under his description of the plant which formed the basis of the species he is more definite: "Crescit in Oriente, in Malabaria, Aegypto, etc."; while in the second edition of Species Plantarum, when he identifies his plant with Rumphius's *Dutra alba*, he extends its range to the Island of Amboyna. Nowhere does he mention its occurrence in the Canary Islands, as cited by Nees von Esenbeck, but it is very probable that "Canara" (the district of Kanara, W. India) mentioned by Rumphius as one of the localities of its occurrence, was mistaken for the Canary Islands by Willdernow, who in the fourth edition of Species Plantarum (p. 1009, 1797) adds this locality to Asia and Africa; and it is this edition of Species Plantarum and not the first (where the species was originally established) that Nees cites, when he rechristens the species and improperly transfers its valid name to another.'

2. **Datura innoxia** Mill., Gard. Dict. (ed. 8) n. 5, 1768; Safford in Journ. Wash. Acad. Sci. 11 (8): 179-180, f. 1 C; id. in Journ. Hered. 12: fig. 12 (3-4); id. in Ann. Rep. Smith. Instit. 1920: 549-550, fig. 3 (2), 4, 5, Pl. 2, 1922.

Datura metel Sims in Curtis, Bot. Mag. t. 1440, 1812; Dun. 543; Clarke, 243; Cooke, 273, et al. recent. auct. Ind. (non Linn.)

This is the plant mentioned in modern Indian floras under the name of *Datura metel*, but it is obvious from the extracts of Safford quoted above that this plant has been wrongly named. 'It is this plant that Dunal in De Candolle's Prodromus called *Datura metel*, in spite of the fact that its stem, according to his own description, is densely pubescent or hairy . . . , its leaves on both sides densely pubescent, and its calyx sparsely so; features which separate it at once from the true Asiatic *Datura metel* L . . . .' (Safford, in Ann. Rep. Smith. Inst., loc. cit. p. 550). This pubescent or hairy plant of American origin is the one I have found to be very abundant in Khandala and other parts of the Province, but always in places near the roads or railway lines. The long spines and pubescence of the fruit are typical of this plant.

3. **Datura arborea** Linn., Sp. Pl. 179, 1753; Cooke, 274; Safford in Journ. Wash. Acad. Sci., 183, f. 1 G; id. in Ann. Rep. Smith. Instit. Pl. 8-9.

A cultivated South American plant, often seen in gardens in various parts of India. According to Cooke, it is very abundant at Mahableshwar where it has been planted as a road-side tree.

The following is a key to the Bombay, wild or cultivated, Daturas:

Herbs or undershrubs:
  Glabrous or subglabrous plants; fruit tuberculate or armed with short spines:
    Corolla single, normally 5-toothed ... *D. metel.*
    Corolla double or triple, outer 5-toothed, inner ones 6-10-toothed ... *D. metel* var. *fastuosa.*
  Pubescent plants; coralla single, 10-toothed; fruit armed with long, weak spines ... *D. innoxia.*
Large shrubs or small trees with very large white flowers and unarmed fruits ... *D. arborca.*

LYCOPERSICON Mill.

'The generic name *Lycopersicon* was first validly published by Miller (Gard. Dict. Abr. ed. 1754) in 1754. In the same year, as well as the preceding, Linnaeus treated the tomato species as a *Solanum* species, a concept in which he was followed subsequently by Miller (Gard. Dict., Posth. Edit., 1807) and others . . . . When the genus was finally recognized generally as being distinct from *Solanum*, Miller's name was used to designate it, but Hill's erroneous spelling (Veg. Syst. 9: 32, 1765), *Lycopersicum*, was adopted, and it was not until Druce (Rep. Bot. Exch. Cl. Brit. Isl. 1913: 433, 1914) in 1914 pointed out the error, that Miller's original name was taken up again . . . ' (Muller, Rev. Gen. Lycopers. 2, 1940).

Lycopersicon esculentum Mill., Gard. Dict. (ed. 8) n. 2, 1768; Graham, 139; Clarke, 237; Schultz, 249; Cooke, 275; Gamble, 941; Merrill, 429; Muller, loc. cit. in U.S. Dept. Agric. Misc. Public. 382: 10, Pl. 2 A-F, 3 A-G, K, 1940; Luckwill, Gen. Lycop., 20, 1943.

Solanum lycopersicum Linn., Sp. Pl. 185; Bonati in Lecomte, Fl. Gen. Indoch., 4: 318, 1915.

Lycopersicum pomum-amoris Moench, 515, 1794.

Lycopersicon lycopersicon Britt. & Brown, Ill. Flor. 3: 168, 1913.

The Love-Apple or Tomato is extensively cultivated in Bombay. Graham loc. cit. remarks: ' . . . also called the *Wolf Peach;* an allusion to its very beautiful appearance, but worthless qualities as a fruit . . . ' From various sources I have heard many complaints against this plant. In Khandala, on the Western Ghauts, it grows luxuriantly and produces plenty of flowers but scarcely any fruit, unless fertilisation is effected by some artificial means. In Bombay it produces fruit in abundance, but the seeds are useless for the following season; this may be the reason why this plant is not more extensively cultivated in Western India, some gardeners assuring me that they have to import seeds from Europe every time they wish to grow tomatoes in their gardens.

NICANDRA Adams

Nicandra physaloides (Linn.) Gaertn., Fruct. 2: 237, t. 141, f. 2, 1791; Clarke, 240; Graham, 140; Dun. 434; Dalz. & Gibs., Suppl., 62; Bot. Mag. t. 2458; Wettstein in Engl. & Prantl, Pflanzenfam. 4, (3B): 7, f. 4A; 11, f. 5 A-F; Cooke, 275.

Atropa physaloides Linn., Sp. Pl. 181, 1753.

A tall, shrubby annual, cultivated in gardens and run wild in some parts of the Province. On Purandhar Hill this is one of the commonest plants. It is an annual growing to a height of 1.5 m., with fairly thick stems and branches. In the post-monsoon period, when there is plenty of moisture in the ground, this plant has a fine appearance with plenty of large leaves and flowers; but after the shedding of the leaves, when the fruits are the only thing left on the otherwise bare branches, the plant looks rank and wild and not attractive; the fruits remain on the plant till the beginning of the rainy season.

With regard to the distribution of the plant in India, in addition to the plants seen growing wild in Khandala and Purandhar (both places in Poona Dt.), I have examined specimens from the following parts of the country in Kew Herb.: a. *Himalayan* and *subhimalayan* region: Treutler 56, Sikkim; Clarke 26944, Darjeeling; Gamble 2386, Sikkim; b. *Simla*, Punjab, etc.: Gamble 2774A; Drummond 25599, 25600; Collett, 580; C. *Assam*: Bor 6308, Kohima; d. *Pulneys, Nilgherries*: Hohenack. 1073; Wight, 2028; Saulière 341; Bourne 2811, 207, 330R; e. *Western India*: Ritchie 518, Belgaum. It is, therefore, correct to say that *Nicandra* in cultivation or as an escape is found on a number of the higher hill stations of the country.

NICOTIANA Linn.

Nicotiana Tabacum Linn., Sp. Pl. 180, 1753; Clarke, 245; Graham, 140; Dun., 557; Dalz. & Gibs., Suppl., 62; Wettstein in Engl. & Prantl, Pflanzenfam. 4, (3B): 33, f. 15 D-J; Comes, Mon. Gen. Nic. 7, 1899; Cooke, 276; Gamble, 941; Merrill, 430.

Cultivated extensively in Gujerat and in some parts of the Deccan and occasionally, though rarely, run wild. The quality of the tobacco produced seems to be rather rough, and on this account not suitable for the better type of cigarrettes; to some extent, this is said to be due to the quality of the soil on which *Nicotiana* is grown. Lately I have learnt of the very encouraging results obtained from the cultivation of the finer types of tobacco in and around Baroda. In some districts, especially Gujerat and Baroda, much harm is done to *Nicotiana* by a parasite (one of the *Orobanches*) which grows attached to the roots of the tobacco plant.

PETUNIA Juss.

Petunia sp. (probably *P. nyctaginiflora* Juss. in Ann. Mus. Par. 2: 216, t. 47, f. 2, 1803) is widely cultivated as a border plant in gardens in Bombay and elsewhere. The bright colours and large size of the flowers and the ease of cultivation render this plant a very suitable one for the purpose. I have not seen it running wild.

CAPSICUM Linn.

Capsicum annuum Linn., var **acuminata** Fingerh., Mon. Gen. Caps. 13, t.2, t. *c*, 1832; Irish, in Rep. Miss. Bot. Gard. 9: 69, t. 10, 1898; Cooke, 276.

C. frutescens Roxb., Fl. Ind. 1: 574, 1832; Graham, 139; Dalz. & Gibs., Suppl. 61; Clarke, 239 (non Linn.)

The common *Chilli*, *Mirchi* or *Lal Mirchi*, extensively cultivated in Western India. I have seen it growing in fields and in flower pots in and around Bombay. It is widely used in chutneys when green, or in curries when ripe. On several occasions I have noticed children in Khandala eating the ripe fruit raw.

As for the other species and varieties of *Capsicum* mentioned by Cooke, I have not seen them cultivated or wild in Western India; they seem, at any rate, to be much less common than the ordinary, popular Chilli.

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BREEDING AND FEEDING HABITS OF MULLETS (*MUGIL*) IN ENNORE CREEK.*

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Studies on mullets in Europe and America show that they usually live and breed in shallow waters and bays where the water is generally brackish. (2) and (3).

The actual spot where the mullet breeds in Indian waters is still a mystery. The location of spawning grounds of mullets, amongst other aspects of bionomics, is of considerable importance in protecting breeders and preserving the fishery both in estuarine and inland waters. Efforts were therefore made during the past year to study mullets in the backwaters at Ennore.

The breeding season of mullets of Ennore.

The following species of mullets occurring at Ennore were identified :—(2).

1. *Mugil oeur* Forsk.
2. *Mugil troschelli* Bleeker.
3. *Mugil dussumieri* Cuv. and Val.
4. *Mugil waigiensis* Q. and G.
5. *Mugil oligolepis* Bleeker.
6. *Mugil tade* Forsk.
7. *Mugil buchanani* Bleeker.
8. *Mugil spleigeri* Bleeker.

Of the above, *M. oeur*, *M. troschelli*, *M. dussumieri* and *M. waigiensis* grow to a foot and more. *M. oligolepis*, *M. dussumieri* and *M. troschelli* are usually caught far up from the sea, while the other species are found both in the channels, in the backwaters proper and the adjacent part of the sea.

Periodical examination of gonads of *Mugil* has confirmed the findings (5) that the mullets of Madras Coast breed soon after the commencement of the monsoon. We observed that at Ennore, the gonads of *M. oeur*, *M. buchanani*, *M. oligolepis* and *M. dussumieri* were ripe from October to May. Even though eggs and larvae of *Mugil* spp., *Anchoviella* spp., *Ambassis* spp., *Leiognathus* spp., *Gerres filamentosus*, *Belone* sp., *Scatophagus argus*, *Chanos chanos*, *Polynemus tetradactylus* and *Tetradon* sp. were available, those of mullets predominated in the plankton collections. These were surface collections made both at the bar and in the centre of the backwater, the duration of haul being 30 minutes in all, 15 minutes each way. Plankton thus collected in the month of December contained mullet larvae and fry. The peak of abundance of these larvae were reached by the middle of December, when thousands, each 1 to 1·2 cms. in length, probably two weeks old, swarmed in the plankton.

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Fecundity of mullets.

From the fact that millions of fry swarm the estuaries and creeks on the Madras Coast just after the North-East monsoon, one may infer that mullets are prolific breeders. Little attempt has been made to determine the rate of production of these valuable fish. In October 1946 the total number of eggs in a ripe female was estimated as follows. The ripe ovaries were completely removed from a mullet and boiled in water when they turned hard and opaque. In this condition the eggs can easily be separated. The ovaries were weighed in a chemical balance. Then, a small portion of the ovary was removed and reweighed. The number of eggs in this portion was counted and from this, the total number of eggs in a ripe female were estimated.

——	Length	Weight	Length of gonads	Weight of gonads in ozs.	Number of eggs
Mugil oeur ...	20·6″	4 lbs.	7·6″	15	1,32,00,000
Mugil buchanani...	8·6″	1 lb.	3·5″	·2	70,000

Probable breeding spot of mullets.

Twenty-four collections of surface plankton were taken in the months of November and December at the bar proper. These collections showed a large number of larvae measuring from 4 mm. to 12 mm. and fry measuring from 15 mm. to 23 mm. Simultaneous collections taken from the backwater, four furlongs inside the bar showed lesser number of fry and larvae. This tends to prove that the mullets actually breed in the sea near the estuary.

Post larvae and fry of mullets.

In life, the mullet post larvae and fry are silvery white in colour. The fins are free from chromatophores except at the basis of the anals and caudals. These pigment cells are uniformly spread on the dorsal half of the body, head and opercles and crowd near the lateral line, making it conspicuous.

Feeding habits of mullets.

Chacko and Venkataraman (1) have recorded the occurrence of a number of phytoplanktonic organisms in the elementary tracts of four out of the eight species dealt with here. To those recorded by them in the guts of these species, may be added the following :—(see pp. 665-7.)

The analysis of the gut contents of these mullets seems to confirm the plankton feeding habits, described by Chacko and Venkataraman (1). The phytoplankton predominates the food. The occurrence of algal filaments, larval molluces polychaetes, crustacean and shell fragments in their gut indicates the browsing habits. These habits are shared by the fry. In small aquaria they can be fed on moss and algal filaments, attached to small stones. Jordon (3) cites Sterns who compares a school of mullets to barnyard fowls feeding together.

NUTRITIVE VALUE OF MULLETS

The predominance of phytoplankton in the food of mullets has a direct bearing on the very high fat content, reaching as high as 7.38% in the case of *Mugil oeur*. Calcium, phosphorus and iron also occur in more than average proportions, Chari (6). Due to their good flavour and high nutritive value, mullets form one of the best table fishes in India.

Species of Mullet	Phytoplankton	Zooplankton	Others
Mugil oeur ...	Rhizosolenia sp. Nitella sp, Asterionella sp. Dityliurn sp. Thalassiothrix sp. Bacillaria sp. Thalassiosira		
Mugil troschelli ...	Planktionella sp. Bacillaria sp. Melosira sp. Biddulphia mobiliensis Coscinodiscus lineatus, and radiatus Coscinosira Thalassiosira Algal zoospores Holosphaera viridis Dityliurn sp.		
Mugil dussumieri ...	Nitzschia seriata Coscinodiscus radiatus Algal filaments	Copepod limbs Fish eggs Larval bivalves	
Mugil waigiensis ...	Nitzschia seriata Coscinodiscus concinnus Asterionella bleakleyi	Setae of annelids Lamellibranch post larvae Copepods Crustacean limbs	Foraminiferan shells. Sand grains.

The following tabulated form gives an analysis for the rest of the species of mullets:—

Species of Mullet	Phytoplankton	Zooplankton	Others
Mugil oligolepis ...	Nitzschia closterium and seriata Coscinodiscus sp. Biddulphia mobiliensis sp. Rhizosolenia sp. Nitella sp. Ditylium sp. Thalassiosira Guinardia flaccida Skeletonema costatum Halosphaera viridis Bacillaria paradoxa	Crustacean limbs Fish eggs Fish scales Larval bivalves Sponge spicules Larvae of Terebella Young beroe	
Mugil oligolepis ...	Pleurosigma sp. Detonula Thalassiothrix sp. Gymnodinium sp. Chaetoceras decipiens Navicula sp.		
Mugil buchanani ...	Algal filaments Rhizosolenia sp. Nitella sp. Coscinodiscus radiatus Asterionella bleakleyi Skeletonema sp. Detonula sp. Thalassiosira sp. Bacillaria sp. Ditylium sp. Thalassiothrix sp. Navicula sp.	Post lavae of Terebella Molluscan larvae of Diphopsalis Oyster eggs Larval polychaetes Setae of polychaetes	Broken bits of shells. Sand grains.

Mugil tade ...	Pleurosigma sp. Nitzchia seriata Closterium sp. Coscinodiscus concinnus Rhizosolenia sp. Asterionella japonica Gymnodinium sp. Ditylium brightwelli Coscinosira polychorda Thalassiosira sp.	Terebella Fish eggs Glochidium larvae Ornicocircus sp.	
M. speigleri ...	Pleurosigma sp. Navicula sp. Skeletonema sp. Detonula sp. Planktoniella sp. Chimacodium sp. Rhizosolenia sp. Guinardia sp. Biddulphia mobiliensis Coscinodiscus concinnus and lineatus	Larval bivalves Auricularia larva	Broken shell bits. Sand grains.

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DESCRIPTIONS OF PLANT GALLS FROM TRAVANCORE

BY

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(*With a plate*)

For the last three years, the author has been making a study of the gall-midges (Itonididae: Diptera) and plant galls. He made extensive collections in different localities in Travancore and he published short descriptions of some interesting plant galls earlier (Nayar, 1944, 1945). This paper gives descriptions of the galls he collected from Travancore during his study, and formed the second part of the thesis approved for the Ph.D. degree of the University of Travancore. The specimens are deposited in the Entomological Laboratory of the University of Travancore, Trivandrum.

The author takes this opportunity to acknowledge his indebtedness to Prof. M. S. Mani, St. John's College, Agra, for his guidance in his work. He wishes to thank Messrs. G. Renga Ayyar of the Entomology Department of the University of Travancore, and P. Kunjukrishna Pillai of the Department of Botany, University College, Trivandrum, for help rendered in the collection of specimens of galls and the identification of the species of the plants respectively.

Eletteria cardamomi Maton (Nat. Ord: Zingiberaceae.).

Root gall: Slightly raised, ridge-like structures, 2 to 8 mm. long, 1 to 2 mm. across, succulent, enclosing a stout maggot.

The gall is produced by *Hallomyia cardamomi* sp. nov. (Itonididae: Diptera). The maggot is fairly large, orange-brown. Jones (1944) mentioned the gall and considered the gall-maker a minor pest of cardamom in Travancore. This is the first description of the gall on cardamom.

Locality: Pampadamparai Hills in the High Ranges of Travancore.

Momordica charantia Linn. (Nat. Ord: Cucurbitaceae.)

Stem gall: A very common gall, distributed throughout South India. Vine-stem galls, elongated, often spindle-shaped, extending along the length of the stem at intervals. Young galls green, older galls slightly brownish, showing exit-holes of the midges.

The galls are produced by *Lasioptera falcata* Felt (Itonididae: Diptera). Docters Van Leeuwen-Reijnvaan (1926) record it from Java. The same insect was bred by Mani (1943) from vine-stem galls on *Momordica diocca* Roxb.

The gall anatomy has been studied by Saksena (1942).

Locality: Trivandrum.

Piper nigrum Linn. (Nat. Ord: Piperaceae.)

Stem gall: Irregular growths on the stem, chiefly the terminal regions often grouped together, 0.5 to 2.5 mm. long and 0.5 to 1 mm. across, soft, succulent, with blackish larval chambers containing large, scarlet-red maggots. Galls green, with indistinct yellow patches.

This is the first record of a stem gall on *Piper nigrum* Linn., from India. A stem gall from *Piper miniatum* Bl., has been recorded from Java by Van Leeuwen (1926).

Galls produced by an unknown Itonidid.

Leaf galls: *Type* 1. 0.5 to 3 mm. in diameter, blackish-grey or greyish-brown, globose structures, hypophyllous, hard, rough, with a single chamber in each gall containing an yellowish-orange maggot. Usually single, rarely five or six very near, but not agglomerate.

Kieffer (1913) records *Trichoperrisia pipericola* Kieff., (Itonididae: Diptera) from leaf galls on *Piper nigrum* Linn., from Peradeniya, Ceylon. This gall may also be produced by the same midge.

Locality: Both the galls from Kottarakarai in Central Travancore.

Leaf galls: *Type* 2. The leaf edges are folded underneath forming small, tubular galls on the lateral margins. The thickened edges show a pitted appearance, and are fleshy, green with slight whitish colouration on the inner side of the lateral canals.

Inside the gall are eggs, nymphs and adults of *Gynaikothrips sp.*, (Thysanoptera).

Gynaikothrips karnyii Bagnall are recorded from similar galls on *Piper nigrum* Linn., from India (Ramakrishna Aiyar and Margabandhu 1940). Similar galls have been recorded from Java by Van Leeuwen-Reijnvaan (1926).

Locality: Trivandrum. I am indebted to my teacher and colleague Mr. A. P. Mathew, University College, Trivandrum, for the donation of the galls and isolated preparations of the thrips.

Leea species (Nat. Ord: Ampelidae).

Stem, leaf stalk and midrib galls: 4 to 23 mm. long, 3 to 14 mm. broad, irregular, where the midrib is affected the galls hypophyllous, soft, succulent growths on the stem, petiole or midrib, in some cases enclosing all these regions and forming an extensive growth, reddish-brown, brownish-green or reddish-green, rarely with a scattered violet tinge. Seven or eight maggots in each gall, occasionally stem galls moniliform. Grey or white spots scattered on the outer side in certain cases.

This is the first record of a gall on *Leea* from India.

Locality: Trivandrum. The gall is produced by an unknown midge.

Tinospora cordifolia Miers. (Nat. Ord: Menispermaceae.)

Stem gall: Irregular growths on stem, 5 to 15 mm. long, 10 to 20 mm. across, greenish-brown in preserved condition, soft, succulent, multilocular, showing number of exit holes of the parasites on the midge.

The gall is produced by an unknown midge (Itonididae: Diptera).

Van Leeuwen-Reijnvaan (1926) describe an inflorescence gall on *Tinospora crispa* Diel., from Java.

Locality: Trivandrum.

Mangifera indica Linn. (Nat. Ord: Anacardiaceae.)

Leaf galls: *Type* 1. The author described this gall (Nayar, 1945) from specimens collected from Trivandrum.

The gall is produced by *Allasomyia tenuispatha* (Kieffer), (Itonididae: Diptera). The first description of the adult midge was given by the author (Nayar 1944).

Locality: Trivandrum and Cape Comorin.

Leaf gall: *Type* 2. Small, ranging from 0.5 to 3 mm. in diameter, coloured violettish-brown or brownish-red in the center, the thickening appearing on either side of the leaf, the whole gall very much compressed. Single, somewhat hard, sometimes more conspicuous on the upper side of the leaf. Reported to be very heavy in the '*pairi*' variety of mango grown in the gardens.

This gall is probably caused by *Procontarinia matteiana* Kieff. & Cecc. (Itonididae: Diptera).

Locality: Cape Comorin.

Leaf gall: Type 3. Shiny black or violettish-black, pellet-like galls, globose, single, 1 to 2 mm. across, hypophyllous, hard, fleshy, with one chamber for the maggot. Mature and growing specimens brown.

This gall is produced by an unknown midge (Itonididae: Diptera).

Locality: Trivandrum.

Sundar Raman (1924) described six galls from mango, and Mani (1935) described an echinate gall on mango leaf. Van Leeuwen-Reijnvaan (1926) describe a leaf gall on *Mangifera timorensis* Bl., similar to that described under Type 1 gall. A gall similar to that described under Type 2 has been recorded from Java and Malacca on *Mangifera indica* Linn. (Van Leeuwen-Reijnvaan 1926).

Ficus dalhousiae Miq (?) (Nat. Ord: Moraceae.)

Leaf galls: Common on the tender leaves, 4 to 10 mm. across, globose or roughly so, single, rarely collective, soft, succulent, yellow or yellowish-brown in contrast to the light green or greyish-green of the leaf, hypophyllous, with a single larval chamber for the maggot in each.

The gall is produced by an unknown Dipterid.

Locality: Kottarakarai in Central Travancore.

Ficus talboti King (?)

Leaf galls: Nayar (1944) described the gall for the first time from India. The galls are usually globose, depressed, epiphyllous growths. The older galls show stony structures inside.

The gall is produced by *Dyanopsylla grandis* Crawford (Psyllidae: Hemiptera). Van Leeuwen-Reijnvaan (1926) describe a similar gall on *Ficus* spp.

Locality: Pampadamparai Hills in the High Ranges of Travancore.

Ficus glomerata Roxb.

Stem galls: The author (Nayar 1944) described this gall for the first time from Travancore. They are irregular growths, coloured brown, on the stem or the petioles, with a rough or tuberculated surface.

The gall is produced by *Pauropsylla depressa* Crawf. (Psyllidae: Hemiptera). The gall was first described incompletely by Sundar Raman (1924); Mani (1935a) gave a complete description of the gall. The gall is recorded from Java also (Van Leeuwen-Reijnvaan, 1926).

Locality: Pampadamparai Hills in the High Ranges of Travancore.

Mesua Ferrea Linn. (Nat. Ord: Guttiferae.) (Pl: I., Fig. 1).

Stem and leaf gall: 3 to 50 mm. long, 2 to 12 mm. thick, sometimes globose, often irregularly spherical, especially those of the midrib, enclosing the distal end of the petiole also, reniform in the specimen collected, epiphyllous, soft, succulent, greenish-brown with many chambers containing stout, yellowish-brown maggots.

This gall is probably produced by *Oligotrophus quadrilobatus* Kieffer (Itonididae: Diptera). This is the first record of a gall on *Mesua* from India; the specimen was collected from the interior of a forest. Bagnall (1929) records a midrib gall on leaf of iron-wood (*Mesua ferrea* Linn.) produced by thrips. He obtained the gall from Malaya, and described it as a spirally twisted structure.

Locality: Pampadamparai Hills in the High Ranges of Travancore.

Memecylon edule Roxb. (Nat. Ord: Melastomaceae.).

Leaf galls: 2 to 6 mm. across, yellowish-green or brownish-green, rounded or hemispherical, single, sometimes collective, hypophyllous, soft, succulent, with one larval chamber in each for a singe maggot. Older galls often blistered showing greyish-black openings covered with fungous growth, the rest of the gall coloured green.

The gall is produced by one of the Diptera.

Locality: Koothattukulam in North Travancore.

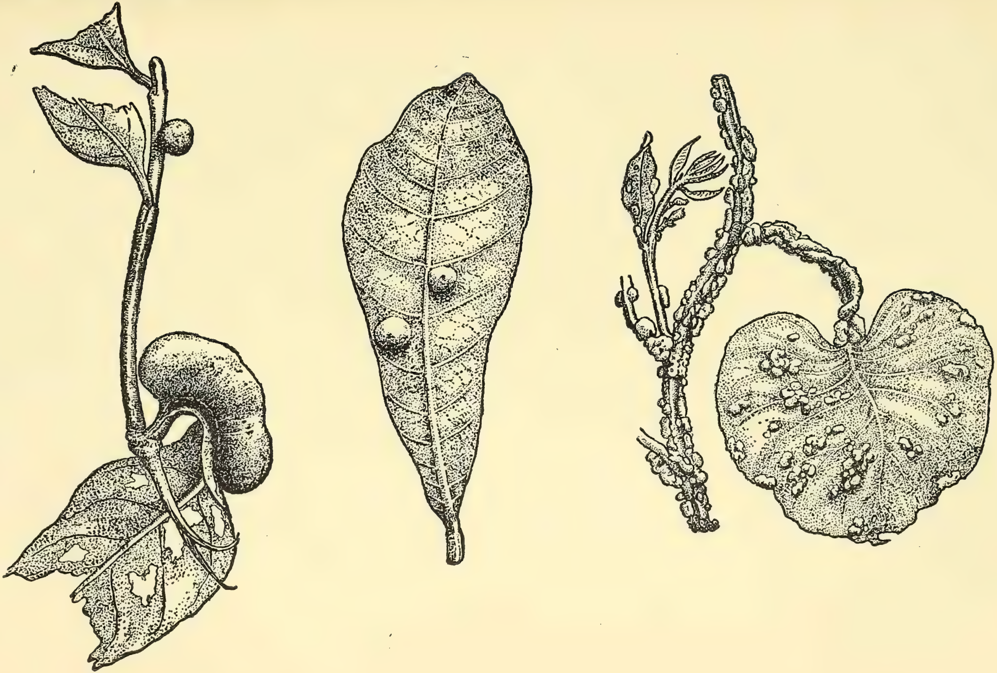

Fig. 1. Stem and leaf gall on *Mesua ferrea* Linn. Fig. 2. Leaf gall on *Holigarna arnottiana* Hk. Fig. 3. Stem and leaf galls on unidentified Convolvulaceous plant.

Memecylon Amplexicaule Roxb.

Leaf galls: Dark green, pustule-like, hypophyllous pouches greatly distorting the base of the amplexicaule leaves, each pouch 0.5 to 3 mm. across, the upper side of the leaf with depressions of the same, the whole forming an overgrown but crumpled mass.

Gall produced by a species of thrips belonging to the genus *Brachythrips* (Thysanoptera).

Ramakrishna Aiyer (1927) described *Brachythrips dentahastha* Rmk., from leaf galls on *Memecylon* sp., collected from Mangalore, South India.

Locality: Thirumala near Trivandrum.

Eugenia Corymbosa Lmk. (Nat. Ord: Myrtaceae.)

Leaf galls: Roundish, irregular, succulent, fleshy, usually single, often agglomerate, hypophyllous, 5 to 15 mm. across, reddish-brown in preserved condition, with a number (two to six) of larval chambers in an average sized gall.

Gall produced by an unknown Dipterid.

Locality: Trivandrum.

Leaf stalk gall: 20 to 27 mm. long, 5 to 12 mm. in diameter, shaped like a thick but small spindle, coloured violettish-brown, smooth, hard, fleshy, with one large, blackish-brown canal-like chamber for the caterpillar. Advanced galls show circular emergence holes and are coloured brownish-black.

The gall is produced by an unknown moth. Stem and petiole galls by a lepidopteron on diverse species of *Eugenia* are recorded by Van Leeuwen-Reijnvaan from Java (1926).

Locality: Pampadamparai Hills in the High Range of Travancore.

Glycosmis Pentaphylla Corr. (Nat. Ord: Rutaceae.)

Leaf galls: Small swellings, 1 to 3 mm. long, and 1 to 2 mm. across, hypophyllous, irregular, on the side of the midrib. The gall is coloured green like the leaf.

The gall is produced by an unknown midge (Itonididae: Diptera). The maggot is small, greenish-yellow. Van Leeuwen-Reijnvaan (1926) describe a midge gall on *Glycosmis cochinchinensis* Pier., (*Glycosmis pentaphylla* Corr. var. *simplicifolia*) and another midge gall on *Glycosmis* sp. (probably *Glycosmis cyanocarpus* Spreng.), but both these are different, from the gall described above.

Bassia Latifolia Roxb. (Nat. Ord: Sapotaceae.)

Leaf gall: Disc-like, circular, 3 to 6 mm. across, very much depressed galls, green with slight tinge of yellow or grey. Single, more prominent on the upper side of the leaf, soft, succulent, each enclosing a small, yellowish maggot.

The gall is produced by a midge (Itonididae: Diptera). Prof. Mani, Agra, informs me (*in litt.*) that he collected the same galls from Hewitt Park, Agra.

Locality: Kallar Bridge Area in South Travancore.

Cinnamomum Zeylanicum Breyn. (Nat. Ord: Laurineae).

Inflorescence stalk gall: Oval, rounded or rarely irregular growths on the stalks of inflorescences, each growth enclosing a greyish slit-like larval chamber, 1 to 5 mm. across, bright green, soft and succulent.

This is the first record of an inflorescence gall on *Cinnamomum zeylanicum* Breyn., from India. A midge-gall.

Locality: Kottarakarai in Central Travancore.

Achyranthus Aspera Linn. (Nat. Ord: Amarantaceae.).

Leaf galls: Beautiful scarlet red leaf galls in patches, irregular, 1 to 4 mm. long and 1 to 3 mm. across, smooth, hypophyllous, like slight swellings with a pitted surface. Usually in the center of the patch-like gall is a cleared area in which rests the nymph of the aleurodid.

Gall produced by *Bemisia tabacci* Gen. (Aleurodidae: Hemiptera). Mani (ms. paper with the Royal Asiatic Society of Bengal dealing with Indian Zoocecidia) described the same gall earlier.

Locality: Trivandrum. This gall was collected and sent to me by Mr. K. Narayana Aiyer, Department of Botany, University College, Trivandrum.

Trewia nudiflora Linn. (Nat. Ord: Euphorbiaceae.)

Leaf galls: Greenish or pale yellow-green, hypophyllous, pouch-shaped galls, 5 to 10 mm. across. Older galls with dark brown or black blister-like patches.

The gall is produced by *Trioza fletcheri* Crawf. (Psyllidae: Hemiptera).

Sundar Raman (1924) recorded this gall. Mani (1935 a) collected the same galls from Coimbatore, Vellore and Calcutta. It is also known from Java (Van Leeuwen-Reijnvaan, 1926).

Locality: Konni forests in Central Travancore. The author wishes to thank Mr. T. N. Somasekharan Nair, of the Travancore Forest Service, for the gift of specimens of this gall.

Phyllanthus emblica Linn. (Nat. Ord: Euphorbiaceae.)

Stem gall: 15 to 25 mm. long, 10 to 20 mm. across, irregular, roughly spindle-shaped, slightly compressed, hard, woody, with a large, single chamber enclosing the small, black caterpillar

The gall is produced by *Betousa stylophora* Swinh. (Lepidoptera). Bose (1935) published some notes on the life history of this species. The gall has been recorded from Java (Van Leeuwen-Reijnvaan 1926); Hong Kong, Burma (Bose 1935) and in India from Tanjore, Pusa and Calcutta (Mani, ms. paper on Indian Zoocecidia).

Locality: Trivandrum, and Pampakuda in North Travancore.

Aporosa Lindleyana Baill. (Nat. Ord: Euphorbiaceae.)

Stem gall: Brown, hard, woody, irregular growths on the stem with a smooth but granulated interior.

The gall maker is not known.

Van Leeuwen-Reijnvaan (1926) record a lepidopteron gall on the stem of *Aporosa microcalyx* Hask., from the East Indies.

Locality: Naduvathumuzhi forests in Central Travancore.

Calophyllum Wightianum Wal. (Nat. Ord: Guttiferae.)

Stem and petiole gall: Galls found as enlargements of the petiole and axillary joints, rarely on the stem. Rounded, reniform or irregular formations, from 10 mm, to 25 mm. long, and 10 to 17 mm. thick, the reniform growth apparently arising from the stem. Where the petiole is affected the gall formed on the under side of the leaf stalk. One gall was found on the stem. Rough, hard and slightly fleshy, brown, usually single. Young galls with the chamber coloured white lodging the nymph of the psyllid.

Gall is produced by an unknown Psyllid (Hemiptera).

A similar gall is recorded from Java on *Calophyllum inophyllum* by Van Leeuwen-Reijnvaan (1926).

Locality: Kallar Bridge Area in South Travancore.

Alstonia scholaris Brown. (Nat. Ord: Apocyanaceae).

Leaf galls: This gall is distributed throughout India. Lefroy (1909) collected it from Pusa. Sundar Raman (1924) quotes the collections of the same from Java by Van Leeuwen-Reijnvaan, from Bismarck Archepelago by Rubsaamen, Phillipine Islands by Uichanco and South India by Ramakrishna Aiyer.

These monothalamous, commonly hypophyllous galls are produced by *Pauropsylla tuberculata* Crawford (Psyllidae: Hemiptera). Mani (1935a) refers to the small, 'barrel shaped, hard, sublignose galls' collected by him from different localities in India. Saksena (1944) describes and figures the gall anatomy.

Locality: Trivandrum.

Strychnos nuxvomica Linn. (Nat. Ord: Loganiaceae.)

Leaf gall: Small, pouch-shaped galls, distributed throughout the leaf, green, 0.5 to 3 mm. across.

The gall is produced by *Diaphorina truncata* Crawford (Psyllidae: Hemiptera.).

Locality: Kundamkadavu near Trivandrum.

Terminalia paniculata Roth. (Nat. Ord: Combretaceae.)

Leaf gall: Sundar Raman (1924) records the gall produced by *Megatrioza hirsuta* Crawford (Psyllidae: Hemiptera) on *Terminalia tomentosa* Bed. Detailed descriptions of the galls occurring on the branch, leaf, flower and fruits of *Terminalia* spp., are given by Mani (1935a), and he figures the tubercular gall on *Terminalia arjuna* Bedd. Saksena (1944) gives an account of the gall anatomy of the leaf gall on *Terminalia arjuna* Bedd., caused by *Trioza fletcheri minor* Crawf.

Locality: Pampakuda near Moovattupuzha in North Travancore, and Konni forest tracts in Central Travancore.

Calycopteris floribunda Lmk. (Nat. Ord: Combretaceae.).

Leaf bud gall: Ramachandra Rao (1923) first recorded this gall produced by *Austrothrips cochinchinensis* Karny (Thysanoptera). He collected it from Taliparamba Pepper Farm in Malabar. Galls are axillary, hollow, crumpled and very malformed structures, green when young and brownish-black or black when old. They look like hanging fruits.

Ramakrishna Aiyar collected the same galls from Tenmalai hills in Travancore and Muliyil collected the same from South Kanara (Ramachandra Rao 1923). Ramachandra Rao (1923) adds 'these galls were called "fruits" by the people about Taliparamba and are known to have medicinal properties being used in preparations for skin diseases by local physicians'.

Locality: Kallar Bridge area in South Travancore. Also from Trivandrum.

Loranthus elasticus Desr. (Nat. Ord: Loranthaceae).

Leaf galls: Leaves very malformed, reduced in size, the edges rolled inwards towards midrib, exposing the under surface; extreme cases appearing like compact, cylindrical scrolls, 25 to 35 mm. in length and 5 to 8 mm. across, the outer surface of leaf taking a greyish colour, the side of the gall dark red, containing the red nymphs of the thrips, the red colour of the gall appearing in irregular patches on the outer side of the scroll of the leaf also. Adult thrips black.

Galls produced by an unidentified thrips. Similar galls on leaves of *Loranthus pentandrus* L., produced by *Eothrips crassicornis* Karny has been recorded from Java by Van Leeuwen-Reijnvaan (1926). An inquiline *Eothrips annulicornis* Karny is also mentioned from Java. A similar gall on *Loranthus lepidotus* Bl. is also noted.

Locality: Trivandrum.

Desmodium species (Nat. Ord: Leguminosae).

Stem gall: Rounded or egg-shaped galls, 4 to 16 mm. long and 4 to 10 mm. broad, green, smooth, succulent, single, with one large chamber for the caterpillar. Older galls with slightly rough exterior, with rounded, black-rimmed exit holes of the adult.

The gall is produced by an unknown lepidopteron. The same gall has been obtained by Mani (ms. on Indian Zoöcecidia) on *Desmodium pulchellum*.

Locality: Cape Comorin.

Phaseolus species (Nat. Ord: Leguminosae).

Stem gall: Bases of branches and stem dilated, fusiform, about 5 to 7 mm. long and 1 to 3 mm. thick. Larval chamber lengthwise.

Gall maker not known. A stem gall on *Phaseolus radiatus* L., caused by *Agromyza* sp. (Diptera) has been recorded from Java (Van Leeuwen-Reijnvaan, 1926).

Tephrosia purpurea Pers. (Nat. Ord: Papilionaceae.).

Stem gall: Brown, greenish-brown, or yellowish-brown when young, hard, woody, rough formations, often fusiform, 5 to 20 mm. long. A very common gall.

Gall produced by *Dactylethra candida* Meyr. (Lepidoptera). The gall is probably widely distributed in South India. Mani (ms. on Indian Zoocecidia) described and figured the gall.

Locality: Trivandrum.

Hibiscus esculentus Linn. (Nat. Ord: Malvaceae.).

Leaf gall: The leaves very much malformed and crumpled, their colour turned yellow, in extreme cases the entire plant is killed off.

Galls produced by *Aphis gossypii* Glov. (Aphidae: Hemiptera).

Locality: Trivandrum, Kottarakarai, Quilon and several other places. Probably distributed throughout S. India.

Root galls: Ridges, pustules, and extensive thickenings on the lateral roots and sometimes the tap roots, coloured greyish-brown, ranging from 0.5 to 10 mm. in length, in many regions appearing like nodules. Fleshy, sometimes single, often the galls of various branches of the roots united.

The gall is produced by *Heterodera radicicola* Greef, the root-knot nematode. Body of the nematode roughly pyriform and glistening. Krishna Iyer (1933) gives a list of the host plants in South India, numbering fifty. Goodey (1933) mentions about six hundred and fifteen host plants for the species. Common among the host plants in India are *Hibiscus esculentus* Linn., *Piper nigrum* Linn., *Cucurbita* spp., *Curcuma* spp., and *Amarantus* spp.

Saksena (1944) has described the anatomy of the gall.

Locality: Trivandrum.

Jasminum grandiflorum Linn. (Nat. Ord: Oleaceae.).

Stem, petiole and leaf gall: Rounded and more often elongated patches of grey or brown irrorated with black, red or brownish-violet, ranging from spot-like thickenings measuring 0.2 mm. across to patches 30 mm. long, and 4 mm. across. Succulent, with reticulated surfaces, the reticulations marked by faint grooves coloured black or brown patches and spots. Common on leaves, present on both sides, usually hypophyllous. Patches on stem and leaf stalk distort the whole vegetative parts of the plant into a twisted mass. An Itonidid maggot (*Octodiplosis fungivora* sp. nov.,) feeds on the spores.

The gall is produced by fungus. Mani (1933) refers to a similar gall on shoots of *Jasminum trichotomum* Heyn., collected from Tanjore. These galls are described as 'cupiform, yellow or yellowish-orange tumescence of the leaves and cortical swellings of the branches'.

Locality: Venganoor near Trivandrum. A very serious attack was reported in 1945.

Hydnocarpus Wightiana Bl. (Nat. Ord: Bixineae.).

Leaf gall: Pouch galls, 2 to 20 mm. long, 2 to 12 mm. broad, irregular, epiphyllous, single, often collected and sometimes forming a twisted mass, green, smooth, occasionally with a pitted surface. On the under surface of the leaf the gall opens out by a very wide orifice being nearly as big as the gall. The interior of the gall is filled with milk-white erineum when young, older galls with the interior yellowish or reddish-brown. Later the interior turns blackish-brown.

The gall is probably produced by a mite (Acarina: Arachnida).

Locality: Trivandrum.

Holigarna Arnottiana Hk. (Nat. Ord: Anacardiaceae.) (Pl. I., Fig. 2)

Leaf gall: Early stages alone were obtained. 3 to 7 mm. across, circular, compressed, with warty outer surface, dark brown or brownish-black contrasting with the dark green leaf, hypophyllous, hard, with granulated interior showing no cavity. In one instance an injured maggot was obtained.

Gall maker not known; it is probably an Itonidid (Diptera).

Locality: Pampadampara Hills in the High Range of Travancore.

Genus not identified (Nat. Ord: Convolvulaceae.) (Pl. I., Fig. 3)

Stem and leaf galls: Irregular galls on branches, leaves and petioles, 1 to 4 mm. across, green, soft and succulent. Inside the galls are soft, yellowish-white hairs.

Galls produced by a mite (Acarina).

Locality: Bhagavathipuram near Shenkottah in Travancore.

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A CENSUS OF NESTS IN A PRIVATE 'BIRD-SANCTUARY'

BY

C. G. WEBB-PEPLOE

(*With a text figure*).

A compound of about forty acres, in which over six hundred people, mostly boys and girls, live all the year round, may not seem very ideal for a bird sanctuary. But the grounds are well planted with trees, and many nesting-boxes invite those species of birds that like holes in which to nest. The children are brought up to observe and protect all wild-life; so it is not surprising that one hundred and thirty-one nests belonging to twenty-nine species were found, mostly in the months of March, April and May 1947. This represents more than this number of nesting pairs of birds, because each colony of Blue Rock-Pigeons is only counted as one, for it was impossible to find out how many pairs were actually nesting. Although many birds built second nests and laid second clutches of eggs, as far as is known, these are not included in the account given below. Many in the family of six hundred contributed to the notes from which this account is compiled, and without their observations and reports I could not have made this survey as complete as it is.

I shall take the species one by one in the order in which they are found in Baker and Inglis's *Birds of Southern India.*

The compound in which this study was made is surrounded by comparatively barren palmyra-land on three sides, with a stretch of paddy land very near to the north. Three small villages adjoin three corners of the land.

1. **Corvus macrorhynchos.** Jungle Crow. *Two nests.*

(1) Neem tree (*Azadirachta Indica*). About 25 feet above the ground.

It was interesting to watch the parent bird which had been out foraging. As it came near the nest it cawed loudly and made its wings vibrate in a peculiar way as it volplaned down to the nest.

(2) *Albizzia Lebbek.* At least 40 feet.

2. **Corvus splendens.** Common Indian House Crow. *Four nests.*

(1) *Ceiba pentandra*: near the extremity of the branch—25 feet.
(2) About 15 feet up in a Neem tree.
(3) Palmyra palm (*Borassus flabellifer*), 80 feet up.
(4) Palmyra palm, 25 feet.

We do not encourage either of these two kinds of crow for they do a good deal of damage to other birds' eggs and young. There is not even honour among these thieves, for one day we watched a Jungle Crow fly to a Common Crow's nest and crack and drink the eggs in spite of much opposition from the owner and its companions. The Jungle Crow finally flew off with the last egg in its beak to enjoy it elsewhere in quiet.

3. **Turdoides griseus.** White-headed Babbler. *One nest.*

Cork tree (*Millingtonia hortensis*) 6 or 7 feet only from the ground in a thick group of suckers which had grown up from the roots of a large tree. This nest was not discovered for a long time although many boys passed close to it daily.

4. **Ægithina tiphia.** Common Iora. *Eight nests.*

(1) Portia tree (*Thespesia populnea*), 6 feet, close to a road much frequented by cattle, and bullock bandies. But it was cleverly hidden by the large leaves of the tree.

(2) *Cassia fistula*, 10 feet, beside a house in which many boys live. This was only discovered after one of the young birds in learning to fly had fallen to the ground. It was kept in a cage for a day or so where its parents trustingly came to feed it, and finally flew away safely.

(3) *Bassia longifolia*, 10 feet, in the centre of a courtyard, often full of boys and noise. This was also pretty well camouflaged by the leaves of the tree.

(4) *Delonix regia*, 15 feet, in the fork of a horizontal branch beside a road. This may possibly have been built by the same pair of birds as No. 3.

(5) *Casuarina equisetifolia*, fairly high up in a very tall tree in a courtyard surrounded by buildings.

(6) *Tabebuia rosea*, 3½ feet, and 10 feet from a house beside a main path.

(7) *Delonix regia*, 15 feet, similar position to No. 4, but in another part of the compound.

(8) *Hibiscus* sp., 4 feet, and only 7 feet from a house in which some children live.

The position of these nests suggests that this species may have a defined territory, but this needs more study. The nests are so beautifully built and so easily escape detection that there may be more than we found within the area.

5. **Molpastes cafer.** Ceylon Red-vented Bulbul. *Three nests.*

(1) Hibiscus, about 6 feet, in a bush growing beside a house.

(2) Neem tree (*Azadirachta indica*), in an open space in which many trees are growing.

(3) Plantain tree (*Musa paradisiaca*), 6 feet, in the hanging bunch of unripe fruit, in one of our market gardens adjoining the residential area. This is a very popular place for this bird to nest. It is surprising that only three nests of this species were found, but it is possible that it prefers plantain groves and such more secluded places, of which there are many not too far away.

6. **Saxicoloides fulicata.** Black-backed Indian Robin. *One nest.*

A hole in a wall about 6 feet high on the outer fringe of the inhabited area. This same pair built again later at the top of a verandah pillar a hundred yards away in the last house in our compound. Though these birds do not shun human beings they never build their nests within a built up area but are often found on the edge of a compound. When the bungalow I occupy was first built it was the furthest out-building near the then limit of our compound; and a pair of these birds reared three broods in succession in one year in the same nest built on the wall-plate that lies along the top of the verandah pillars.

7. **Copsychus salauris.** Indian Magpie Robin. *Eleven nests.*

(1) *Albizzia lebbek*, a natural hole, 15 feet. This tree has many holes in which Rose-ringed Paroquet, Brahminy Myna, and Yellow-throated Sparrow also have nested within recent years.

(2) *Caryota urens*, in the hollow where the leaf-sheath clasps the trunk, 10 feet, beside my house. This palm was planted many years ago and has to be watered as it does not usually grow on the plains. This pair had a second brood in an old hollow log, twenty-five yards away, which we had tied up on a tree as a nesting-box. This log has an interesting history. Many years ago it came as a piece of firewood from the foothills. One of our men heard a peculiar noise coming from the pile of firewood, and, after investigation, found a nearly-fledged Ceylon Green Barbet, still alive after the tree had been cut down and cut up and carted to our compound. It was reared and tamed and lived with us for many months. This log has formed a nesting place for several generations of Magpie-Robins.

(3) Custard-Apple tree (*Annona squamosa*), 10 feet, in an old earthenware pot tied up to attract bees, beside a house.

(4) Roof of a house, where the main roof overhangs and joins a lean-to, 7 feet, at the end of a school building where boys come and go all day.

(5) In a 'rose' watering-can which was hanging in a bush, beside a well.

(6) Verandah roof of a bungalow at the corner where the cross beams and roof timbers form an enclosed hollow. This site has been used for several years, 7 feet.

(7) *Thevetia neriifolia*, 4 feet. The tree is beside a much-frequented path on one side, and about 5 feet from the verandah of a house on the other side. This is the second year this hole has been used. It is more a hollow than a proper hole, and the eggs can easily be seen.

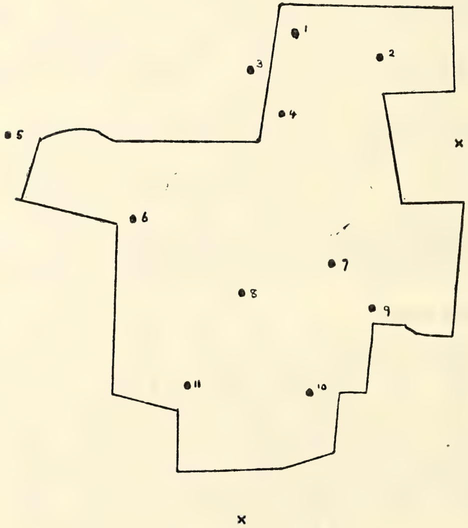
(8) Bamboo-section nesting-box, 7 feet, in *Lawsonia inermis*, behind and close to a bungalow. This was used for two broods this year.

(9) Rain-tree (*Samanea saman*), a natural hole, 10 feet. In another hole in the same tree a Coppersmith was building.

(10) Neem tree (*Azadirachta indica*), a natural hole, 12 feet. This is apparently looked upon as a very desirable building-site, for during past years it has been the scene of fierce and prolonged fights between Yellow-throated Sparrow and Common Myna, Magpie-Robin and Golden-backed Woodpecker. The two latter have several times nested there to my knowledge, and at least twice a swarm of bees (*Apis indica*) has occupied it in the off-season.

(11) Verandah roof of a bungalow in exactly similar position to No. 6, about three hundred yards away from it. Magpie Robins have increased greatly in numbers during the twenty years I have been here. From one or two pairs they now number at least fifteen pairs, for I knew of other nests this year just outside the area under consideration. The interesting thing is that when I go for 'bird-walks' in the surrounding countryside, more often than not we never see a single Magpie-Robin. It seems as if they

MAGPIE-ROBIN TERRITORIES.



definitely look upon our compound as a protected area. But they have very clear ideas concerning territory. About sixty yards is the nearest any two nests were found; and within their kingdom each male bird has one or two high points, usually the topmost branch of a tree, from which he sings, especially in the morning (often beginning before dawn), and in the evening, during the nesting period. We have several times seen trespassers being punished.

The two crosses in the diagram indicate two other pairs of birds whose range was in each case a vegetable and fruit garden, but their nests were not found. In view of Mr. Kingdon Ward's letter on page 549 of Volume 46, No. 3 of the *Journal*, I should like to draw attention to Nos. 4, 6 and 11 above, which show that it is not at all uncommon with us for Magpie-Robins to build their nests in occupied human dwellings. Our birds are very tame and quite unafraid of us.

8. **Dicrurus macrocercus.** King-Crow. *One nest.*

Albizzia lebbek, 25 feet, cleverly built in a bunch of leaves growing where the tree had been pollarded. This bird does not suffer marauders gladly, and it will attack any kites or crows however innocent they may appear if they fly at all near the nesting-tree. I have known smaller birds nest in the same tree. Is it because of the safety this affords to them?

9. **Orthotomus sutorius.** Indian Tailor-bird. *Nine nests.*

(1) Guava (*Psidium guajava*), under 6 feet, close to a house. Nearly all the nests are very close to inhabited buildings.

(2) *Hibiscus* sp., 5 feet, under the eaves of a bathroom so that no amount of heavy rain touched it.

(3) Indian Almond (*Terminalia catavpa*), 7 feet up.

(4) *Bougainvillea* sp., 3 feet, beside the porch of a house.

(5) *Porana volubilis*, 6 feet.

(6) *Butea frondosa*, 6 feet. This was built by a foolish pair, for when the wind blew the nest tilted up so that the young fell out.

(7) *Citrus* sp.

(8) Indian Almond.

(9) *Bignonia magnifica* near to a verandah.

One of these pairs for its second attempt built three nests, one about 8 feet high in a Cannon-ball tree, one only 2 feet from the ground in the leaves of a yam, and the third less than 2 feet off the ground in a *Bryophyllum pinnatum* plant. The last was not completed and I think the first was finally used. I often saw it trying to separate threads from some rough string used to tie up a creeper. It would take hold of a loose end and try to fly away, but usually the string was too strong and it failed.

10. **Temenuchus pagodarum.** Brahminy Myna. *One nest.*

A nesting-box of the ordinary square box-like type 15 feet up in a Tamarind tree (*Tamarindus indica*). Two broods were hatched out successively in this box.

11. **Acridotheres tristis.** Common Myna. *Three nests.*

(1) Palmyra palm, 30 feet, two trees were growing close together, and two leaves, one from each tree, supported each other. In the hollow of one opened leaf this nest was visible through the leaf to any one standing below.

(2) Palmyra palm, 40 feet, in the crown. This has been used as a nesting-site for many years.

(3) Coconut palm (*Cocos nucifera*) about 25 feet, in a garden on the edge of the compound.

These mynas are bullies. I have seen them sitting and shouting beside a Yellow-throated Sparrow's nesting hole which was far too small for them to use. The sparrow was frantically flying round, but they stayed for a long time, sometimes looking in, sometimes just sitting beside it. They have nested in natural holes in neem and palmyra trees, and also in our square nesting-boxes in other years.

12. **Gymnohris xanthocollis.** Yellow-throatel Sparrow. *Twenty-four nests.*

(1) Bamboo nesting-box in tamarind tree, 20 feet.
(2) Square nesting-box in tamarind tree, 20 feet.
(3) *Albizzia lebbek*, natural hole, 15 feet.
(4) Hole in a wall, 8 feet, previously used by a hoopoe. As soon as the hoopoe's young were fledged a pair of sparrows moved in.
(5) *Albizzia lebbek*, natural hole where a branch had died and rot set in, 20 feet.
(6) Bamboo nesting-box, in neem tree, 20 feet, occupied as soon as put up.
(7) Log nesting box in neem tree, 20 feet.
(8) Bamboo pole stored in the roof of a carpentry-shed, about 8 feet high.
(9) Neem tree, natural hole, 10 feet. As this tree is beside one of our tame pigeon-cotes it has a plentiful supply of feathers for lining the nest.
(10) Bamboo nesting-box in neem tree, 15 feet.
(11) Bamboo nesting-box in tamarind tree, 15 feet.
(12) *Albizzia lebbek*, natural hole, 15 feet.
(13) Bamboo nesting-box in neem tree, 10 feet.
(14) *Albizzia lebbek*, natural hole, 30 feet.
(15) Bamboo roof pole in a garden lean-to, 8 feet.
(16) One of a pile of stored bamboos, 3 feet.
(17) *Albizzia lebbek*, natural hole, 25 feet.
(18) Hole in corner of roof of church tower, about 50 feet high. This was used in previous years by a pair of hoopoes.
(19) Hole in corner of main roof of church, 15 feet.
(20) Rain-tree (*Samanea saman*), natural hole, 15 feet.
(21) Square nesting-box in a tamarind tree, 15 feet.
(22) Hole made by a misplaced tile in bungalow verandah roof, 7 feet. When the young were being taught to fly, one fell to the ground among some plants at the edge of a path. A pariah dog passed by, and the mother, constantly calling, flew low over its back to distract it. Fortunately the young bird remained quiet. We later retrieved it and put it back into the nest.
(23) Bamboo nesting-box in neem tree, 20 feet.
(24) Neem tree, natural hole, 15 feet.

These birds are exceedingly common. They seem to have no territorial jealousies, for some of the nests were only about fifteen yards apart. There were many other nests in the lands round about our compound. Any fresh bamboo box put up during the nesting season was very soon occupied by a pair of these sparrows. They are much more dapper and generally better behaved than their cousins the House-Sparrows, though when a cold-weather flock of them descends on a field of grain they can do considerable damage.

13. **Passer domesticua**. House-Sparrow. *Four nests.*

(1) Hole in well-wall, 10-12 feet down.
(2) Hole in well-wall, 10-12 feet down.
(3) Hole in well-wall, 10-12 feet down. Owing to heavy rain this season the holes were under water in some wells, so there were fewer nests of this species this year.
(4) Hole in roof of an old building.

In one of the villages outside our compound is an old church, with a large tower built more than a hundred years ago. Here there are many more nests of this species.

14. **Motacilla maderaspatensis**. Large Pied Wagtail. *One nest.*

Hole in a well-wall. This well has been disused for some years. It is just outside our boundary on a piece of waste-land. This pair nested twice in 1946 in the roof of a new building then unoccupied, in our compound.

15. **Mirafra assamica**. Madras Bush-Lark. *One nest.*

On a bare piece of land directly adjoining our most easterly building. We have reared these birds as pets, and they are most attractive.

16. **Eremopterix grisea** Ashy-crowned Finch-Lark. *One nest.*

On the same piece of land, used for dry crops only in the N.-E. Monsoon season.

17. **Cinnyris zeylonica.** Purple-rumped Sunbird (198). *Sixteen nests.*

(1) *Bougainvillea* sp.
(2) *Pongamia glabra*, 6 feet.
(3) *Cassia fistula*, 7 feet.
(4) Pomegranate (*Punica granatum*), 5 feet.
(5) *Tamarindus indica*, 10 feet.
(6) *Cassia siamea*, 8 feet.
(7) *Cassia fistula.*
(8) *Phyllanthus acidus.*
(9) *Hibiscus* sp.
(10) *Butea frondosa.*
(11) *Tamarindus indica.*
(12) Rangoon Creeper.
(13) *Tecoma.*
(14) *Lawsonia inermis* (Henna).
(15) Pomegranate (*Punica granatum*).
(16) Neem tree, 4 feet.

All these nests were under 10 feet from the ground and many as low as 4 or 5 feet. Many times they build their nests on creepers growing over our houses, and on several occasions they have attached their nests to sprays hanging inside the porch entrance to bungalow rooms where our children live, so that it has been possible to watch them at very close quarters during the whole nesting period.

18. **Brachypternus benghalensis.** Southern Golden-backed Woodpecker. *One nest.*

Albizzia lebbek, natural hole, 20 feet.

This is common in our compound, and in previous years pairs have nested in various places within and just outside our boundaries.

19. **Megalaima haemacephala.** Indian Crimson-breasted Barbet. *One nest.*

This pair had one nest in a hole in a *Thevetia neriifolia* and a second in a hole in a Rain-tree. We have known them often to nest in holes in *Albizzia.* We have never yet been able to entice this or No. 18 to occupy a nesting-box.

20. **Centropus sinensis.** Southern Crow-Pheasant. *One nest.*

In a cactus hedge on the boundary of an outlying garden. We do not encourage this bird for it has an uncanny way of finding other birds' nests and destroying the contents.

21. **Psittacula krameri.** Rose-ringed Paroquet. *One nest.*

Albizzia lebbek, natural hole. This also nests in the church tower in the village outside our gates.

22. **Halcyon smyrnensis.** Indian White-breasted Kingfisher. *Two nests.*

Hole in a well-wall about 12 feet down.

Hole in a pit dug in the ground, only a foot or two under the ground level. These birds often build in holes dug out in the mud walls of our rubbish pits. We have brought them up as pets. It was beautiful to see one we had fly down out of a nearby tree to take a small fish from a boy's outstretched hand. Then it would fly back up into the tree.

23. **Upupa epops.** Ceylon Hoopoe. *Two nests.*

(1) Hole in a wall, about 8 feet, at the back of a shed.
(2) Square nesting-box in a neem tree, 15 feet.

This box was really put up to attract, if possible, a homeless swarm of bees (*Apis indica*). The hole was only about an inch in diameter. One day in April a hoopoe found this, and began to enlarge the hole. It took two days' hard work to make it large enough for the bird to enter. Within less than a hundred yards were two other sites used during the past three years by a pair of hoopoes, but it did not use them, preferring to carve out a new home for itself.

24. **Athene brama.** Southern Spotted Owlet. *Two nests.*

(1) An old earthenware pot, in a Portia tree, put up for bees, 10 feet.

(2) A hole in a well-wall, 12 feet. The two young fell into the well before they were fledged but were rescued. This has built in our square nesting-boxes, from which also the young often fall out.

25. **Astur badius.** Indian Shikra. *Two nests.*

(1) Cork tree (*Millingtonia hortensis*), 30 feet.

This nest we destroyed as it had three young and the parent birds to feed them were causing great havoc among the smaller birds nesting nearby.

(2) *Albizzia lebbek.*

26. **Columba livia.** Indian Blue Rock-Pigeon. *Three colonies.*

(1) In the roof of our clock-tower, 60 feet high. Very soon after this was built the birds occupied it.

(2) An old brick dove-cote, 10-15 feet high, used for domestic doves, but later left empty, has also now been taken over by a colony of the Blue Rock-Pigeons. They are semi-domesticated, but never become quite tame.

(3) A granary roof. Perhaps they were led there by the hopes of spilt grain, but in these days of shortage they do not get much.

Another colony is in the old village church tower mentioned before.

We also have four separate dove-cotes for tame pigeons which our boys rear, and these undoubtedly help to attract birds to our compound.

27. **Streptopelia chinensis.** Indian Spotted Dove. *Ten nests.*

(1) *Albizzia amara*, 4 feet.
(2) Verandah roof, 7 feet.
(3) *Morinda citrifolia*, 10 feet.
(4) *Citrus* sp., 5 feet.
(5) *Tristellatia australasia*, a creeper on a house.
(6) Verandah roof, 7 feet.
(7) Verandah roof, 7 feet.
(8) Verandah roof, 7 feet.
(9) *Jasminum* sp., a hedge, 4 feet.
(10) *Petrea volubilis*, climbing over a gate, 7 feet.

The casualty rate among the eggs and young of doves seems immense, and yet they remain common. Those that build on the wall plate above verandah pillars try to put their sticks in many places before they succeed in building a whole nest. One bird was seen adding sticks to the nest while the other bird was sitting on it. Sometimes when the sitting bird gets up to fly away the whole nest slides off.

28. **Streptopelia senegalensis.** Indian Little Brown Dove. *Six nests.*

(1) Verandah roof, 7 feet.

(2) Verandah roof, 7 feet. These are very tame and almost allow themselves to be touched on the nest.

(3) *Porana paniculata*, a thick hedge, 4 feet.
(4) *Petrea volubilis*, a scandent against a wall, 10 feet.
(5) *Cycas rumphii*, in the crown, 4 feet.
(6) Two eggs were found among ferns under a pergola, from which the nest must have blown down.

29. **Ardola grayi.** Paddy-bird. *Nine nests.*

(1) *Tamarindus indica*, 20 feet. (February)
(2) & (3) *Tamarindus indica*, 20 feet. (April)
(4) Cork tree (*Millingtonia hortensis*), 15 feet. (April)
(5) *Peltophorum inerme*, 15 feet. (April)
(6) & (7) *Tamarindus indica*, 20 feet. (July)
(8) & (9) Neem tree, 25 feet. (July)

These birds were nesting in April and at intervals right on through August. They make the plants and ground beneath their nests very unclean, so are rather a nuisance.

In other years the following birds have also nested within this area:—

Dendrocitta vagabunda. Indian Tree-Pie.

Tephrodornis pondiceriana. Indian Common Woodshrike.

In neem, tamarind and banyan (*Ficus bengalensis*) trees.

Uroloncha malabarica. White-throated Munia.

In a cactus hedge.

Eudynamis scolopaceus. Indian Koel.

Eggs have been often found in Common Crow's nests.

Merops orientalis. Common Indian Bee-eater.

In furrows of ploughed field, and in a bank of earth which had been excavated when digging a well.

Alcedo atthis. Common Ceylon Kingfisher.

In the side of a small pit.

Milvus migrans. Common Pariah Kite.

In a tamarind tree.

Nycticorax nycticorax. Night Heron.

A colony in tamarind trees.

SPORTSMANSHIP AND ETIQUETTE IN SHOOTING

BY

LT.-COL. E. G. PHYTHIAN-ADAMS, O.B.E., F.Z.S., I.A. (RETD.)

The importance of taking steps for preserving the wild life of India before it is too late is stressed in a brochure on the subject by Lt.-Col. R. W. Burton, which has recently been circulated to members of the Society and which appears in this issue of the *Journal.* Poaching, the greatest problem of all, can only be countered by effective legislation drastically enforced, but much unnecessary destruction of wild life is caused by sportsmen through ignorance of sportsmanship, and it is felt that the present is a suitable time to re-publish the following article, which first appeared in 'Indian Wild Life' in 1936, and was later re-printed in the 'Forester'. Some alterations and additions to the original text have been made, but in general the principles advocated by me 12 years ago seem as applicable to-day as then. The following is the amended reprint:—

Considering the large number of books on shikar and sporting reminiscences in India which have appeared during the past 80 years, a curious omission will strike the thoughtful reader in the almost entire absence of any reference to sporting ethics. The budding big game shikari who in 9 cases out of 10 has not even handled a shot-gun before, is anxious to do the right thing, but when he endeavours to ascertain exactly what may be done and what emphatically may not, he is generally referred to the 'Unwritten Laws' of Sport, or worse, follows the example of a man older than himself but quite as ignorant. But why should these 'Laws' remain unwritten? We have a Highway Code, then why not a Shooting one also? Shooting ethics have changed enormously in the last 80 years. The senseless and indiscriminate slaughter of Col. Pollock's time terminated about the 80's with a series of well-defined game laws and shooting rules in most parts of India, and sportsmanship in shooting had certainly reached a very high standard at the time of the outbreak of the First Great War. Since then, however, there has been a marked deterioration due in part to such factors as improved weapons, increase of motor transport, and lack of senior officers interested in shooting and capable of passing on the sound ideas of the previous generation. But whatever the cause, it exists; and it is in the hope of arousing interest and discussion, and also of giving a helping hand to the young shikari that these notes are penned. The writer who has spent 44 years in India, served in North, West, Central and South India, in Upper and Lower Burma, and in Ceylon, and spent all available leave on shikar, so he can claim a fairly extensive knowledge of the varying kinds of sport and conditions in different parts of the country. What he would most emphatically disclaim is any idea of posing as an authority.

'Quot homines, tot sententiae', and in the following pages he has endeavoured to hold a fair balance between divergent views.

Before proceeding further let us try to define 'Sport' as applied to big game shooting. It is suggested that a reasonable definition would include some element of risk (even if only the risk of being found out), a certain amount of physical exertion, and the exercise of some skill in jungle-craft and with the rifle; while the object should be to kill as painlessly as possible, and not to fire at dangerous game unless prepared to face the risks involved in a possible follow-up.

The shooting rules in force in practically every part of India rightly prohibit the shooting of females, of stags in velvet or without horns, and of undersized heads; and as regards these the tyro can have no doubt, while we will give him the credit of realising the heinousness of appropriating another man's kill. But there are other problems which are bound to arise sooner or later, and which are not definitely legislated for. It is proposed to deal with the more important of these seriatim.

(1) First and probably most controversial of all is the question of first blood. In a beat *A* fires at and wounds a tiger which goes on and is then killed by *B*. To whom does the skin belong? In the old days there was a well-recognised rule that whoever drew first blood even though the wound was a slight superficial one was entitled to the trophy; but in more recent times the more reasonable standard adopted has been the infliction of the first disabling but not necessarily mortal wound. This, however, is not always too easy to decide, so it would be as well to settle beforehand exactly which procedure is to be adopted. If this is not done, in case of doubt toss for it.

(2) *Following-up a wounded animal next day.* Is the man who wounded it in the first place entitled to the trophy or the man who finally kills it? This case appears to be on all fours with the preceding one and the criterion should be the infliction of the first disabling wound. But if the pursuit has been definitely abandoned, then the trophy decidedly belongs to the gun who may finish off the wounded animal, having encountered it either by chance or design, and possibly after an interval of several days.

It need scarcely be added that it is the duty of *all* members of a party to assist in following up a wounded tiger, and equally that beaters should *never* be used to drive out an animal under such conditions.

(3) *Is it unsporting to sit up for a tiger?* Certainly not. There are many jungles in India and Burma where beating is impossible—then again the sportsman may not be able to afford the expense of beaters. In such cases sitting up is perfectly justified, and the discomforts and general lack of success attending this form of shikar are a sufficient contradiction to the idea that it is easy and taking an unfair advantage. Sitting up for panther over a goat is widely practised. What objection then can there be to sitting up for tiger? A mug's game many consider it, but it is certainly not unsporting. The writer would add that the majority of his meagre score of tigers have been shot on foot and none by sitting up, so he may claim to be impartial as regards the ethics of the latter.

(4) *Should artificial light be used when sitting up?* Here we are entering on very controversial ground, for some shikaris assert that

it is taking an unfair advantage, and so strongly is this view held in some quarters that certain shooting rules definitely prohibit its use. But is this justified? The whole object of big game shikar should be to kill as cleanly as possible, and any reasonable artificial aid which will help should surely be used. Objections to it appear to the writer both selfish and unjustified.

(5) *Should one sit up over water or a salt lick?* This is generally prohibited in the shooting rules except in the case of carnivora, but is it justified even in the case of the latter? As regards water at any rate, that prime necessity of life, the idea rather offends one's sense of fairplay and it should be avoided as far as possible, though obvious exceptions may be made in the case of a man-eater or a persistent cattle killer which cannot be brought to book otherwise, or in the case of that pest of the jungle—the wild dog.

(6) *Is the use of a telescopic sight justified?* Certainly, as it provides increased accuracy of aim and thereby fulfils the object already referred to. For sportsmen with defective eyesight or in the case of crocodile shooting where extreme accuracy is needed it is a most efficient aid, but it should of course not be used to increase range and to take shots beyond sporting distances.

(7) *What are sporting distances?* In the jungle visibility generally limits the range to under 100 yards. In the hills or on open plains shots should not as a rule be taken over 200 and never beyond 300 yards. At a tiger or other dangerous game the distance is limited by the necessity for inflicting a mortal wound with the first shot. Long shots are therefore inadvisable, as they will almost certainly involve a follow-up with all its inherent risks.

(8) *What radius of action should be reserved to a party already in camp?* In this connection The Hon'ble J. W. Best writes in 'Indian Shikar Notes':—'Outside the forest laws there are some general principles of etiquette which are observed among shikaris. If shooting outside regularly allotted blocks, provided his position is legally sound, the first comer has prior claim and should in no way be molested'. This is admirable so far as it goes, but something more definite seems needed to prevent a jealous sportsman from claiming more than his fair share of country. To meet the case it is suggested that no other party should shoot within 2 miles of the first comer's camp and that this should be extended to 5 miles if members of the latter are tying up for tiger.

(9) *Is shooting from motor cars justified?* Most emphatically not: it is pure slaughter and offends two maxims of our definition, viz. absence of risk and absence of physical exertion. What satisfaction can anyone derive from a trophy obtained in this way? Unfortunately this pernicious practice is on the increase and steps require to be taken to put a stop to it throughout India as has already been done in E. Africa. Shooting in this way by day is bad enough but it is far worse at night as many wounded animals escape to die a lingering death or in the case of carnivora to be a menace to some unfortunate villager. Europeans and wealthy Indians who indulge in this unsporting practice should know better and not set such a bad example to their humbler fellow sportsmen. 'Mere killing', says F. W. F. Fletcher in *Sport on the Nilgiris*, 'is not sport: the real charm lies in the feeling that you have pitted your reason against

the quarry's instinct and won the equal fight, that your trophy is the reward of your own skill. This feeling is the very essence of sport and it makes success doubly sweet'.

(10) *Is shooting from elephants sporting?* For tiger in high grass it is a well recognised procedure; for other animals it approximates too closely to motor car shooting to justify its being called sporting, though it will doubtless be practised for all time by 'princes and rich men'.

(11) *What limits should one make to shooting one particular species?* One has read in shikar books that the ideal should be to shoot the largest head possible and having obtained it not to shoot smaller, but the latter view appears very altruistic, and there seems no valid reason why the sportsman should not continue shooting this species if he wants to and provided that he never lets it degenerate into shooting for shooting's sake. After all trackers and servants are only human and a camp will not be a very cheerful or successful one if master never fires a shot because he can find no head larger than what he had already bagged possibly many years before.

(12) *Is it sporting to shoot a tigress with cubs?* Provided the cubs are big enough to forage for themselves, say the size of panthers, no reasonable objection can be raised. In some shooting rules a limit of 8 feet is prescribed which seems unnecessarily large and would be extremely difficult to estimate. No real sportsman would deliberately fire at a tigress with small cubs, and the same applied to panthers and bears with young.

(13) *What is the best shot to take?* At an animal standing broadside on, with a high velocity rifle fire *at* the shoulder so that the bullet may carry pieces of bone through the heart. The old idea of firing *behind* the shoulder may result in the bullet being placed too far back; it dates back to the old days of black power rifles firing in many cases a very light bullet which might flatten out a bone and fail to penetrate. At an animal facing, place your bullet where the neck joins the chest. Head shots should be avoided as far as possible owing to the risk of the bullet glancing off the skull. When you do shoot remember not to fire into the brown but pick a vital spot, and never press the trigger unless you are certain that your target is really what you think, and not an unfortunate villager draped in a blanket or hiding behind a bush.

(14) *What is the best rifle to use?* For jungle work and dangerous game a double-barrelled high velocity rifle of ·470 bore will meet the case, and for hill shooting or on the plains a small bore magazine rifle. But it is not everyone who can afford a double-barrelled rifle, and as an all-round weapon the ·423 (10·75 m/m) Mauser can be recommended. It is cheap and will deal with anything from a barking-deer to an elephant. The writer has used one for many years and has seldom found a second shot to be necessary.

For dangerous game it is *not* advisable to use a small bore rifle firing a light bullet. This is not to say that a tiger cannot be killed with a ·303; it can, and so for that matter can an elephant, and it would also be possible to kill a tiger with a ·22, though no one in his senses would try it. The whole point lies in the punch given by the bullet, if the aim is not absolutely correct, due to haste or an unexpected movement. With a ·423 bullet there is a knock-down blow which simplifies the follow-up, whereas unless the ·303 bullet is placed in exactly the right spot either the sportsman is going to strike trouble or the animal will get away to die a lingering death. Those interested in the subject are advised to study Major Gerald Burrard's 'Notes on Sporting Rifles'.

(15) Take every opportunity to destroy vermin, more especially wild dogs, which do so much damage and for which incidentally a good reward is paid by Government in most Provinces.

To sum up; remember our definition and the object; play fair and be considerate of others, and do not take refuge in that old fallacy 'Why shouldn't I? It's not in the shooting rules'?

Before however he gets a chance at big game our tyro is almost certain to have the opportunity of some small game shooting. Here the problems are less complex for we are concerned more with behaviour in the field than with any question of ethics. If our tyro has not been taught how to carry a gun and the maxim of 'Safety first,' then let him study and memorise the following rules, for he may rest assured that non-observance of them will certainly result in few if any invitations to join a party. Nor is it only the tyro who would benefit by correct behaviour, for many men who have been shooting in India for years and who should know better are appallingly ignorant in this respect and some indeed can only be classed as criminally careless.

(1) Always carry your gun so that it points to the ground or to the sky. Never hold it so that it points at anyone else even though you *know* that it is unloaded. Many accidents have happened in this way in the past and continue to do so annually because the gun *was* loaded.

(2) Always unload before crossing an obstacle or before getting into a car or boat or before handing your gun to a shikari or before entering a house.

(3) Do not fire unless you can see where you are shooting. There may be a man ploughing behind that hedge or an old woman crouching beyond that bush.

(4) Do not shoot over your shikari when he bobs down. He may rise as you fire the left barrel and receive the contents in his head.

(5) When shooting in company do not be selfish nor fire at another man's birds.

(6) Do not fire long shots. You will waste cartridges, make yourself unsteady and only wound game. 40 yards is the average extreme killing range of a 12-bore, and most birds are shot at under 30 yards.

(7) Do not worry about your daily cartridge average but take all fair shots that offer.

(8) Do not shoot more than you can dispose of. The man who has to bury or throw away game is no sportsman.

(9) Do not fire into the brown but pick your birds. Besides being more sporting it is more profitable!

(10) Do not let wounded birds be carried on the game stick.

(11) Do not send a man to retrieve a bird from a weedy tank.

(12) Don't grouse if most of the shooting has gone to the other guns. Your chance will come sooner or later.

(13) Shoot for sport and don't worry about the size of the bag or getting your money's worth.

Briefly then the good sportsman will be keen, careful, considerate and humane.

A few other points remain to be mentioned :—

(1) It seems hardly necessary to say that it is not sporting to shoot a hare in its form or birds on the ground or in a tree, though a a first barrel into duck on the water is not considered unfair.

(2) The man first on the ground has prior claim and a shikari cannot reserve a ground for his master : the latter must be present in person.

(3) When two parties are shooting from the same rest-house, they should come to some mutual agreement as to direction from day to day, to avoid spoiling one another's sport ; the party which arrived first having of course prior choice.

(4) Misses are mostly behind, so swing your gun to your bird and keep on swinging till after you have pressed the trigger.

In conclusion the budding sportsman is advised to read and digest all the shikar books he can get hold of, among which can be specially recommended Col. A. E. Stewart's 'Tiger And Other Game', A. A. Dunbar Brander's 'Wild Animals in Central India', and The Hon'ble J. W. Best's 'Indian Shikar Notes'.

BIRD MIGRATION IN INDIA

A COMPLETE LIST OF RINGED BIRDS RECOVERED UP TO DATE (INCLUDING THOSE NOTIFIED IN THE *Journal* FROM TIME TO TIME)

No. of ring	Date	Name of bird	Place where ringed	Remarks (adult or young)	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks
Dhar 71 *(Series 2)	14 Feb. 1929	Common Teal	Purnia Tank, Dhar State	(Young)	Ahmad Nur	16 Jan. 1931	Major King	Champanir, Baroda State	Reported as widgeon.
Dhar 82 (Series 2)	14 Feb. 1929	Common Teal (*Nettion crecca*)	Do.	'Young' (?)	Do.	31 Mar. 1935	Central Bureau for Bird Ringing. Rostokinsky Proyezd, 13, Moscow, 14.	Village of Novo Prokovskoe; Region of Kantovski 14 km. off town Frunse (formerly Peshpek c. 42°26′N., 74° 15′E.)	......
Dhar 116 (Series 2)	23 Feb. 1929	Common Teal	Do.	Do.	Do.	Autumn 1929	M. P. Golairu	Vasugana River near North Machutaivs, Tomsk.	Identity of species not given by recoverer.
Dhar 29 (Series 1)	Feb. 1926	White-eyed Pochard (*N. rufa*).	Dhar State.	...	H. H. Maharaja	March 1926	Private Secretary, Dhar.	Lekoda Tank just north of Fatehbad, near Ujjain, Gwalior State (c. 23°33′N., 75° 70′E).	Shot by Lieut. A. Gimson, R. A.
Dhar 94 (Series 2)	Feb. 1925	Widgeon (*Anas penelope*)	Do.	...	Do.	Early May 1926	Do.	Jand Station N.W., Rly. (near Campbellpur c. 32° 78′N., 72° 25′E.)	Shot by local shikari.

Dhar ? (Series 1)	Feb. 1926	Not recorded.	Dhar State	...	H. H. Maharaja	5 April 1926	Private Secretary, Dhar.	Jalwal village (Attock district).	Shot by Police constable, Jhind State.
Dhar 58 (Series 1)	Feb. 1926	Pochard (*N. ferina ferina*)	Do.	Male	Do.	30 May 1926	Do.	Nr. Ssusslowo village 20 km., from Barnaul Town, Siberia.	Report communicated by Prof. Hermann Johansen of Tomsk University. Published in 'Uragus', pages 30-31, No. 1, 1927.
Dhar 38 (Series 1)	Feb. 1926	Widgeon (*Anas penelope*)	Do.	Female	Do.	1 Aug. 1928	Prof. B. N. Shitkov of Univ. Zool. Mus., Moscow.	Ilbosch Lake near Kargat Rly. Station, Omsk-Tomsk Railway, west of Novo Nikolajewsk (55° 50′N, 80°E).	Reported accompanied by young. Published in 'Uragus' by J. M. Salesski.
Dhar ? (Series 1)	Feb. 1926	Pintail (*Anas acuta acuta*)	Do.	Do.	Do.	29 May 1927	W. Troizky, Curator, Zool Dept., Novo Sibirsko Museum in 'Uragus' p. 26, No. 4, 1927.	River Tira, left branch of Tiga, tributary of Chatanga (Middle Tunguska).	Captured by native. Report also published, Vol. XXXVI, No. 3, May 1929 'Orn. Moratsb.'.
Dhar 43 (Series 1)	Feb. 1926	Widgeon (*Anas penelope*)	Dhar State (ca 23°N × 76°E)	Male	Do.	15 Aug. 1928	Prof. B. M. Shitkov, Univ. Zool. Museum, Moscow (letter 22-1-1929).	West Siberia, near mouth of river Tara, affluent of the Irtysh (c. 56° 30′N × 74° 40′E.)	Shot by K. F. Dessiatoff. Moulting and unable to fly.
Dhar ? (Series 1)	Feb. 1926	Pochard (*Nyroca ferina*)	Dhar State.	...	Do.	28 Dec. 1928	Private Secretary, H. H. Dhar (letter No. 55 dated 20-1-1929).	A tank in Dhar State.	Shot by Col. Davenport.

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2111	11-12-1928	Red-crested Pochard (*Netta rufina*)	Jhajja, Bahawalpur State	♀ adult	G. Atkinson, Shikar Officer.	6 -3-'29	D. Sviatski, Scientific Secy., Central Bureau of Regional Survey, USSR. Leningrad.	A lake near R. Amu Daria (37° 21′N × 66°20′E) Russian Turkestan.	580 miles NNW of Bahawalpur. 'The duck had an old healed wound on the lower part of the beak'.
2128	11-12-'28	Pochard or Dun Bird (*Nyroca f. ferina*)	Do.	♂ adult	Do.	25 -5-'30	J. M. Zalessky ...	Bolschie Tochty, Barabinsk Dist., Siberia (54°42′N × 76° 04′E.)	According to recoverer a ♀!
2165	12-12-'28	Mallard (*Anas platyrhyncha*)	Do.	♂ adult	Do.	? May '29		Near Station Volchikhina; Dist. of Slavgorod (52° 20′N × 79°20′E.)	......
2182	12-12-'28	Teal (*Nettion crecca*)	Do.	♂ adult	Do-	2 -2-'29	G. S. Khan ...	On river Tochi or Gambila, near Bannu, NWF Prov., (ca. 32°N × 71 °E.)	Recovered after 71 days, ca. 260 miles due N.
2195	12-12-'28	Mallard (*Anas platyrhyncha*)	Do.	♀ adult	Do.	10 -3-'30	Lt.-Stockley Roper.	Mastus, Chitral State (36° 15′N × 72° 30′E.)	Shot by local. Recovery after 369 days.
3373	23 -1-'29	Wigeon (*Anas penelope*)	Manchar Lake, Larkana Dist., Sind (ca. 26°40′N × 67°60′E.)	♀ adult	R. B. MacLachlan	28 -3-'29	D. Sviatski, Leningrad	Near river Syr-Darya (Russian Turkestan, 45° 10′N × 65° 15′E.)	Recovered after 64 days, ca. 1,325 miles due N.

3384	23 -1-'29	Do.	Do.	♀ adult	Do.	20 -9-'29	Director, Bird Banding Station USSR—Moscow	Village Nishny-Aremzyane; Dist., Tobolsk, (58° 12′N × 66° 11′E.)	Recovered after 246 days, ca. 2,300 miles due N.
2783	26 -1-'29	Mallard (*Anas platyrhyncha*)	Do.	♀ adult	Do.	25 -4-'29	Bureau of Regional Survey, Leningrad.	Ishimsk Dist., Ural, near village Okunjevo, W. Siberia, (56° 35′N × 67° 20′E.)	......
2784	26 -1-'29	Gadwal (*Anas streperus*)	Do.	♀ adult	Do.	10 -7-'30	Central Bureau of Bird Banding, Moscow.	Siberia. Village, Novovoznessenskaya, 18 km. from Tartarsk town. (c. 55°20′N × 75° 50′E.)	......
2763	25 -1-'29	Wigeon (*Anas penelope*)	Do.	♂ adult	Do.	8 -5-'29	Do.	Village Yarylino, Circuit Tomsk, W. Siberia, Region Kolpachevsky, (58° 20′N × 82° 57′E.)	......
720	12 -2-'29	Coot (*Fulica atra*)	Indore State ...	adult	Conservator of Forests, Indore	? -3-'29	Bird Banding Bureau, Moscow.	Near Station Vello-Alexeevskaya, Province Tashkent, Trans-Siberian Rly.	......
1803	9 -2-'29	Pintail (*Anas acuta*)	Sujawal, Karachi Dist., Sind.	♂ adult	Meherally Shah ...	25 -2-'29	M. G. Mirza ...	Thain Dhund, Sujawal Taluka, Sind.	......
1820	9 -2-'29	White-eyed Pochard (*Nyroca rufa*)	Do.	adult	Do. ...	23 -2-'29	G. R. Stein ...	Near Sujawal, Sind.	......
2952	17- 1-'29	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan (39° 20′N × 76°E).	♂ adult	Capt. G. Sherriff	24 -1-'29	Capt. Sherriff ...	Near Kashgar ...	Killed by trained falcon.

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2195	12-12-'28	Mallard (*Anas platyrhyncha*)	Do.	♀ adult	Do.	10 -3-'30	Lt.-Stockley Roper.	Mastus, Chitral State (36° 15′N × 72° 30′E.)	Shot by local. Recovery after 369 days.
3373	23 -1-'29	Wigeon (*Anas penelope*)	Manchar Lake, Larkana Dist., Sind (ca. 26°40′ N × 67°60′E.)	♀ adult	R.B. MacLachlan	28 -3-'29	D. Sviatski, Leningrad	Near river Syr-Darya (Russian Turkestan, 45° 10′N × 65° 15′E.)	Recovered after 64 days, ca. 1,325 miles due N.
3384	23 -1-'29	Do.	Do.	♀ adult	Do.	20 -9-'29	Director, Bird Banding Station USSR—Moscow	Village Nishny-Aremzyane ; Dist., Tobolsk, (58° 12′N × 66° 11′E.)	Recovered after 246 days, ca. 2,300 miles due N.
2783	26 -1-'29	Mallard (*Anas platyrhyncha*)	Do.	♀ adult	Do.	25 -4-'29	Bureau of Regional Survey, Leningrad.	Ishimsk Dist., Ural, near village Okunjevo, W. Siberia, (56° 35′N × 67° 20′E.)	......
2784	26 -1-'29	Gadwal (*Anas streperus*)	Do.	♀ adult	Do.	10 -7-'30	Central Bureau of Bird Banding, Moscow.	Siberia. Village, Novovoznessenskaya, 18 km. from Tartarsk town. (c.55°20′N × 75° 50′E.)	......
2763	25 -1-'29	Wigeon (*Anas penelope*)	Do.	♂ adult	Do.	8 -5-'29	Do.	Village Yarylino, Circuit Tomsk, W. Siberia, Region Kolpachevsky, (58° 20′N × 82° 57′E.)	......
720	12 -2-'29	Coot (*Fulica atra*)	Indore State ...	adult	Conservator of Forests, Indore	? -3-'29	Bird Banding Bureau, Moscow.	Near Station Vello-Alexeevskaya, Province Tashkent, Trans-Siberian Rly.	......
1803	9 -2-'29	Pintail (*Anas acuta*)	Sujawal, Karachi Dist , Sind.	♂ adult	Meherally Shah ...	25 -2-'29	M. G. Mirza ...	Thain Dhund, Sujawal Taluka, Sind.	... ..
1820	9 -2-'29	White-eyed Pochard (*Nyroca rufa*)	Do.	adult	Do. ...	23 -2-'29	G. R. Stein ...	Near Sujawal, Sind.	... ..
2952	17- 1-'29	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan (39° 20′N × 76°E).	♂ adult	Capt. G. Sherriff	24 -1-'29	Capt. Sherriff ...	Near Kashgar ...	Killed by trained falcon.

RECOVERIES OF RINGED BIRDS—(contd.)

No. of ring	Date	Name of bird	Place where ringed	Remarks	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks
2972	27-1-'29	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan (ca. 39° 20′N × 76°E).	♂ adult	Capt. G. Sherriff	1-2-'29	Capt. Sherriff	3 or 4 miles from Kashgar.	Shot by a member of the Soviet Consulate-General.
2973	27-1-'29	Do.	Do.	♂ adult	Do.	1-5-'31	Bird Banding Bureau, Moscow	Village Lukovka, Region Pankrushicha Circuit Kamensky, West Siberia (55°51′N × 80°18′E).	
2992	30-1-'29	Do.	Do.	♀ adult	Do.	A few days after ringing	Capt. Sherriff	Near Kashgar	Killed by trained falcon.
3005	1-2-'29	Do.	Do.	♂ adult	Do.	Do.	Do.	Do.	Do.
3110	8-3-'29	Wigeon (*Anas penelope*)	Manchar Lake, Sind	adult	Haji Rab Rakhio Lakho	7-1-'30	Game Fisheries Officer, Kashmir State	Anchar Lake, between Gandarbal & Srinagar (Kashmir).	Reported by recoverer as gadwal ♂ adult (*A. streperus*).
469	1-4-'29	Garganey (*Querquedula querquedula*)	Rajghat, Bettiah, Champaran, Bihar	♂ adult	A. C. Harman	11-4-'29	W. McGregor	Jhandola, Dist. Mozaffarpur (Bihar & Orissa)	80–100 miles S. E. of ringing place.
3624	30-3-'29	Shoveller (*Spatula clypeata*)	Bhupinder Sagar, Patiala State	♂ adult	W. M. Hutton	?-4-'29	Central Bird Banding Bureau, Moscow	West Siberia, nr. Kzyl-Orda, mouth of river Tara affluent of Irtysh.	
884	18-3-'29	Gadwal (*Anas strepera*)	Hygam Lake, Kashmir	adult	Controller, State Rukhs	early April 1930	I. G. of Police, Kashmir	Chalda (Kashmir State).	Killed by hawk.
2875	12-12-'28	Mallard (*Anas platyrhyncha*)	Manchar Lake Sind (ca. 24° 50′N × 67°00′E)	?	C. Chatterji	6-7-'29	Central Bureau of Regional Survey, Leningrad	Near village Krestinskoye, Omsk Prov., W. Siberia. (ca. 55°N × 74° 40′E.)	

3953	19-1-'30	Pochard (*Nyroca rufa*)	Khahi Lake, Sujawal Taluk, Karachi Dist.	adult	Meherally Shah	end April 1933	Central Bird Banding Bureau, Moscow (vide letter dated 25-4-'35).	Village Solo-Tuba Kazak Autonomous Republic, (former Syr-Daria Region 44° 34′ N × 66° 7′ E.)	"♂"
3048	9-12-'29	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan	♀ adult	Capt. G. Sherriff	14-1-'30	Capt. Sherriff	Kashgar	Shot by a Turki.
1524	11-12-'29	Do.	Do.	♀ adult	Do.	22-12-'29	Do.	Kizil Su River, Kashgar	Shot by ringer.
1507	19-12-'29	Do.	Do.	♂ adult	Do.	26-12-'29	Do.	3 or 4 m. from where released on 19 Dec.	Snared. Too weak to release again.
1517	14-12-'29	Do.	Do.	♂ adult	Do.	14-1-'30	Do.	Kashgar	
117	31-12-'29	Do.	Do.	♂ adult	Do.	13-1-'30	Do.	,,	Shot by a Turki.
121	31-12-'29	Do.	Do.	♀ adult	Do.	ca 1-1-'30	Do.	Near Kashgar	Shot by a Turki.
376	29-12-'29	Do.	Do.	♂ adult	Do.	9-1-'30	Do.	Kashgar	Caught by hand. Weak & emaciated owing to severe cold spell.
1442	30-12-'29	Do.	Do.	♂ adult	Do.	ca 1-1-'30	Do.	Near Kashgar	Shot by a Turki.
382	26-12-'29	Do.	Do.	♂ adult	Do.	27-12-'29	Do.	Shot on river close to where caught but 3 or 4 m. from where released.	
1013	14-1-'30	Do.	Do.	♂ adult	Do.	14-1-'30	Do.	Kashgar	Caught by a hawk. Shot by a Turki.

RECOVERIES OF RINGED BIRDS—(contd.)

No. of ring	Date	Name of bird	Place where ringed	Remarks	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks
2972	27-1-'29	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan (ca. 39° 20′N × 76°E).	♂ adult	Capt. G. Sherriff	1-2-'29	Capt. Sherriff	3 or 4 miles from Kashgar.	Shot by a member of the Soviet Consulate-General.
2973	27-1-'29	Do.	Do.	♂ adult	Do.	1-5-'31	Bird Banding Bureau, Moscow	Village Lukovka, Region Pankrushicha Circuit Kamensky, West Siberia (55°51′N × 80°18′E).	
2992	30-1-'29	Do.	Do.	♀ adult	Do.	A few days after ringing	Capt. Sherriff	Near Kashgar	Killed by trained falcon.
3005	1-2-'29	Do.	Do.	♂ adult	Do.	Do.	Do.	Do.	Do.
3110	8-3-'29	Wigeon (*Anas penelope*)	Manchar Lake, Sind	adult	Haji Rab Rakhio Lakho	7-1-'30	Game Fisheries Officer, Kashmir State	Anchar Lake, between Gandarbal & Srinagar (Kashmir).	Reported by recoverer as gadwal ♂ adult (*A. streperus*).
469	1-4-'29	Garganey (*Querquedula querquedula*)	Rajghat, Bettiah, Champaran, Bihar	♂ adult	A. C. Harman	11-4-'29	W. McGregor	Jhandola, Dist. Mozaffarpur (Bihar & Orissa)	80–100 miles S. E. of ringing place.
3624	30-3-'29	Shoveller (*Spatula clypeata*)	Bhupinder Sagar, Patiala State	♂ adult	W. M. Hutton	?-4-'29	Central Bird Banding Bureau, Moscow	West Siberia, nr. Kzyl-Orda, mouth of river Tara affluent of Irtysh.	
884	18-3-'29	Gadwal (*Anas strepera*)	Hygam Lake, Kashmir	adult	Controller, State Rukhs	early April 1930	I. G. of Police, Kashmir	Chalda (Kashmir State).	Killed by hawk.
2875	12-12-'28	Mallard (*Anas platyrhyncha*)	Manchar Lake Sind (ca. 24° 50′N × 67°00′E)	?	C. Chatterji	6-7-'29	Central Bureau of Regional Survey, Leningrad	Near village Krestinskoye, Omsk Prov., W. Siberia. (ca. 55°N × 74° 40′E.)	
3953	19-1-'30	Pochard (*Nyroca rufa*)	Khahi Lake, Sujawal Taluk, Karachi Dist.	adult	Meherally Shah	end April 1933	Central Bird Banding Bureau, Moscow (vide letter dated 25-4-'35).	Village Solo-Tuba Kazak Autonomous Republic, (former Syr-Daria Region 44° 34′N × 66°7′E.)	"♂"
3048	9-12-'29	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan	♀ adult	Capt. G. Sherriff	14-1-'30	Capt. Sherriff	Kashgar	Shot by a Turki.
1524	11-12-'29	Do.	Do.	♀ adult	Do.	22-12-'29	Do.	Kizil Su River, Kashgar	Shot by ringer.
1507	19-12-'29	Do.	Do.	♂ adult	Do.	26-12-'29	Do.	3 or 4 m. from where released on 19 Dec.	Snared. Too weak to release again.
1517	14-12-'29	Do.	Do.	♂ adult	Do.	14-1-'30	Do.	Kashgar	
117	31-12-'29	Do.	Do.	♂ adult	Do.	13-1-'30	Do.	,,	Shot by a Turki.
121	31-12-'29	Do.	Do.	♀ adult	Do.	ca 1-1-'30	Do.	Near Kashgar	Shot by a Turki.
376	29-12-'29	Do.	Do.	♂ adult	Do.	9-1-'30	Do.	Kashgar	Caught by hand. Weak & emaciated owing to severe cold spell.
1442	30-12-'29	Do.	Do.	♂ adult	Do.	ca 1-1-'30	Do.	Near Kashgar	Shot by a Turki.
382	26-12-'29	Do.	Do.	♂ adult	Do.	27-12-'29	Do.	Shot on river close to where caught but 3 or 4 m. from where released.	
1013	14-1-'30	Do.	Do.	♂ adult	Do.	14-1-'30	Do.	Kashgar	Caught by a hawk. Shot by a Turki.

RECOVERIES OF RINGED BIRDS—(contd.)

No. of ring	Date	Name of bird	Place where ringed	Remarks	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks.
1001	14-1-'30	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan	♂ adult	Capt. G. Sherriff	15-1-'30	Capt. Sherriff	Kashgar	Shot by a Turki
1012	14-1-'30	Do.	Do.	♂ adult	Do.	15-1-'30	Do.	Do.	
1271	21-3-'30	Shoveller (*Spatula clypeata*)	Bilhan – Manchar Sehwan Taluka–Sind	♀ adult	K. G. Advani	25-5-'30	I. M. Zalessky	Near village Aksenowka, Barabinsk Dist., Siberia, (54°42′N × 76° 04′E.)	
789	11-2-'31	Do.	Manchar Lake, Sind	♀ adult	R. B. MacLachlan	5-1-'32	U. M. Ansari	Suigam, North Gujerat (via Radhanpur).	
3126	10-3-'29	Gadwal (*Anas strepera*)	Do.	adult	Haji Rab Rakhio	11-3-'30	Anton Liesmewilsch.	Uzbekistan, near the station Kagan, New Bokhara, (ca 40°N × 64°E.)	
3412	30-12-'29	Red-crested Pochard (*Netta rufina*)	Kambar, Sind	...	H. A. L. French	9-7-'32	Central Bird Banding Bureau, Moscow	Lake Baikal, Siberia.	
1810	9-2-'29	Pintail (*Anas acuta*)	Sujawal, Karachi Dist.	♂ adult	Meherally Shah	15-5-'29	Prof. B. M. Shitkov	Near Samarovo, Tobolsk Dist., Confluence of rivers Ob and Irtysh (ca. 60°N × 70°E.)	

3354	23-1-'29	Gadwal (*Anas strepera*)	Manchar Lake, Larkana Dist., Sind.	♀ adult	R. B. MacLachlan	9-8-'31	Central Bird Banding Bureau, Moscow.	Western Siberia; north of Ust-Vissk Region (54° 5′N × 64°20′E.)	
2673	25-1-'29	Widgeon (*Anas penelope*)	Manchar Lake	♂ adult	R. B. MacLachlan	7-5-'29	Central Bird Banding Bureau, Moscow.	Village Yaryline Region Kalpach. Evsk Circuit Tomsk, W. Siberia.	
3929 D (Moskwa)	9-7-'31	Glossy Ibis (*Plegadis f. falcinellus*)	'Damtchik' Astrakhan Game Preserve Volga Delta. (ca. 45° 55′N × 47°45′E.)	Juvenile	Central Bird Banding Bureau, Moscow.	14-3-'34	Capt. Wright	Deolali	Distance flown roughly 2,800 miles.
4172	17-2-'39	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur State.	...	Bharatpur Durbar	11-3-'39	Prof. B.A.Chohan, Habibia College, Kabul.	3 miles from Kabul Afghanistan	
65765 D (Moskwa)	July '38	Coot (*Fulica atra*)	Lake Alakul, Kazakhstan, nr. lake Balakhash.	...	Central Bird Banding Bureau, Moscow.	19-2-'39	Game Warden, Kashmir (Letter No. 1101 dated 21-3-'39).	Hokra Lake near Srinagar, Kashmir.	
54244 E (Moskwa)	26-7-'37	Garganey Teal (*Querquedula querquedula*)	North Kazakhstan, on Lake Teten (54°10′N × 76° 05′E.)	♀	Do.	1937	Do.	Drig, Larkhana District, Sind.	
13753 B (Moskwa)	28-7-'38	Spoonbill (*Platalea leucorodia major*)	Astrakhan State Preserve, Volga Delta.	Nestling	Do.	26-10-'38	Do.	Kolhapur State	
4200	23-2-'39	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur State.	...	Bharatpur Durbar	30-1-'40	Do.	3 miles from Chhatari, U.P.	

RECOVERIES OF RINGED BIRDS—(contd.)

No. of ring	Date	Name of bird	Place where ringed	Remarks	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks.
1001	14-1-'30	Mallard (*Anas platyrhyncha*)	Kashgar, Chinese Turkestan	♂ adult	Capt. G. Sherriff	15-1-'30	Capt. Sherriff	Kashgar	Shot by a Turki
1012	14-1-'30	Do.	Do.	♂ adult	Do.	15-1-'30	Do.	Do.	
1271	21-3-'30	Shoveller (*Spatula clypeata*)	Bilhan – Manchar Sehwan Taluka–Sind	♀ adult	K. G. Advani	25-5-'30	I. M. Zalessky	Near village Aksenowka, Barabinsk Dist., Siberia, (54°42′N × 76° 04′E.)	
789	11-2-'31	Do.	Manchar Lake, Sind	♀ adult	R. B. MacLachlan	5-1-'32	U. M. Ansari	Suigam, North Gujerat (via Radhanpur).	
3126	10-3-'29	Gadwal (*Anas strepera*)	Do.	adult	Haji Rab Rakhio	11-3-'30	Anton Liesmewilsch.	Uzbekistan, near the station Kagan, New Bokhara, (ca 40°N × 64°E.)	
3412	30-12-'29	Red-crested Pochard (*Netta rufina*)	Kambar, Sind	...	H. A. L. French.	9-7-'32	Central Bird Banding Bureau, Moscow	Lake Baikal, Siberia.	
1810	9-2-'29	Pintail (*Anas acuta*)	Sujawal, Karachi Dist.	♂ adult	Meherally Shah	15-5-'29	Prof. B. M. Shitkov	Near Samarovo, Tobolsk Dist., Confluence of rivers Ob and Irtysh (ca. 60°N × 70°E.)	
3354	23-1-'29	Gadwal (*Anas strepera*)	Manchar Lake, Larkana Dist., Sind.	♀ adult	R. B. MacLachlan	9-8-'31	Central Bird Banding Bureau, Moscow.	Western Siberia; north of Ust-Vissk Region (54° 5′N × 64°20′E.)	
2673	25-1-'29	Widgeon (*Anas penelope*)	Manchar Lake	♂ adult	R. B. MacLachlan	7-5-'29	Central Bird Banding Bureau, Moscow.	Village Yaryline Region Kalpach. Evsk Circuit Tomsk, W. Siberia.	
3929 D (Moskwa)	9-7-'31	Glossy Ibis (*Plegadis f. falcinellus*)	'Damtchik' Astrakhan Game Preserve Volga Delta. (ca. 45° 55′N × 47°45′E.)	Juvenile	Central Bird Banding Bureau, Moscow.	14-3-'34	Capt. Wright	Deolali	Distance flown roughly 2,800 miles.
4172	17-2-'39	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur State.	...	Bharatpur Durbar	11-3-'39	Prof. B.A. Chohan, Habibia College, Kabul.	3 miles from Kabul Afghanistan	
65765 D (Moskwa)	July '38	Coot (*Fulica atra*)	Lake Alakul, Kazakhstan, nr. lake Balakhash.	...	Central Bird Banding Bureau, Moscow.	19-2-'39	Game Warden, Kashmir (Letter No. 1101 dated 21-3-'39).	Hokra Lake near Srinagar, Kashmir.	
54244 E (Moskwa)	26 7-'37	Garganey Teal (*Querquedula querquedula*)	North Kazakhstan, on Lake Teten (54°10′N × 76° 05′E.)	♀	Do.	1937	Do.	Drig, Larkhana District, Sind.	
13753 B (Moskwa)	28-7-'38	Spoonbill (*Platalea leucorodia major*)	Astrakhan State Preserve, Volga Delta.	Nestling	Do.	26-10-'38	Do.	Kolhapur State	
4200	23-2-'39	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur State.	...	Bharatpur Durbar	30-1-'40	Do.	3 miles from Chhatari, U.P.	

RECOVERIES OF RINGED BIRDS—(contd.)

Records not previously published in the Journal

No. of ring	Date	Name of bird	Place where ringed	Remarks	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks
4219	Nov./Dec. 1940	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur.	...	Bharatpur Durbar	25-2-'40	R. E. Hodson	A jheel at Kandi Tazadin, ca. 12 miles from Peshawar.	......
4148	26-12-'39	Wigeon (*Mareca penelope*)	Do.	adult	Do.	6-4-'40	Director of Game Preserves, Moscow.	Near Station Proletarskaja, Tashkent Railway, Tadzikistan	......
81029 E (Moskwa)	...	Glossy Ibis (*Plegadis falcinellus*)	......	...	......	ca 15-4-'42	L. R. Fawcus, Calcutta.	On a marsh, Malda District, Bengal.	Ringing data awaited from Moscow.
60276 D (Moskwa)	...	Pintail (*Anas acuta*)	......	♂	......	21-2-'40	F. Ludlow, Srinagar.	Pampur, near Srinagar, Kashmir.	Do. (Shot by Col B. T. Phillips).
68993 D (Moskwa)	...	Pintail (*Anas acuta*)	Astrakhan State Reserve (Volga Delta, Russia).	♂	Central Bird Banding Bureau, Moscow.	28-1-'40	F. Ludlow	Gujranwala District, Punjab.	Shot by Fateh Ali Shah. Data awaited from Moscow.
54294 E (Moskwa)	...	Garganey Teal (*Querquedula querquedula*)	......	♂	......	26-1-'39	Capt. L. D. W. Hearsey, Kneri, U.P.	Khajua Tal, Bhur Estate, Kheri District, U. P.	......
4202	24-2-'39	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur.	adult	Bharatpur Durbar	24-9-'40	Central Bird Banding Bureau, Moscow.	Environs of Ashkhabad.	......

4209	23-2-'39	Do.	Do.	adult	Do.	18-2-'40	Janglat Officer, Bharatpur (letter 1326 of 1940).	Bharatpur	One year later, in same locality.
10005 F (Moskwa)	June '29	Green Sandpiper (*Tringa ochropus*)	Environs of city of Kazan.	...	Central Bird Banding Bureau, Moscow.	...	......	Nr. Kottayam (Travancore).	......
32713 D (Moskwa)	16-8-'37	Gadwal (*Anas strepera*)	N. Kazakhstan, 20 km. from Ak-Suat Lake, on Syur-Karassu Lake.	Juvenile	Central Bird Ringing Bureau, Moscow.	30-12-37	......	South of Hadero, Sind Lower Indus.	......
206701 (Helgoland)	11-6-'30	White Stork (*Ciconia ciconia ciconia*)	Nr. Braunschweig, Germany (c. 52°16′N × 10° 30′E).	Juvenile (nestling)	Heligoland Biological Station.	Nov. '30	Bikaner Durbar.	Bikaner, Rajputana (78° N × 73° 15′E).	Found dead and in a dried up condition by edge of small lake.
27381 (Budapest)	30-6-'25	Rosy Pastor (*Pastor roseus*)	Village Novaj, N. E. Hungary (47° 55′N × 20° 30′E.)	Nestling	Royal Hungarian Ornithological Institute.	28-4-'26	M. J. Sheikh.	Lahore, Punjab.	......

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Bombay,
31 *July*, 1948.

EDITORS

RECOVERIES OF RINGED BIRDS—(contd.)

Records not previously published in the Journal

No. of ring	Date	Name of bird	Place where ringed	Remarks	Name of ringer	Date of recovery	Reported by	Place where recovered	Remarks
4219	Nov./Dec. 1940	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur.	...	Bharatpur Durbar	25-2-'40	R. E. Hodson	A jheel at Kandi Tazadin, ca. 12 miles from Peshawar.	......
4148	26-12-'39	Wigeon (*Mareca penelope*)	Do.	adult	Do.	6-4-'40	Director of Game Preserves, Moscow.	Near Station Proletarskaja, Tashkent Railway, Tadzikistan	......
81029 E (Moskwa)	...	Glossy Ibis (*Plegadis falcinellus*)	......	...	......	ca 15-4-'42	L. R. Fawcus, Calcutta.	On a marsh, Malda District, Bengal.	Ringing data awaited from Moscow.
60276 D (Moskwa)	...	Pintail (*Anas acuta*)	......	♂	......	21-2-'40	F. Ludlow, Srinagar.	Pampur, near Srinagar, Kashmir.	Do. (Shot by Col B. T. Phillips).
68993 D (Moskwa)	...	Pintail (*Anas acuta*)	Astrakhan State Reserve (Volga Delta, Russia).	♂	Central Bird Banding Bureau, Moscow.	28-1-'40	F. Ludlow	Gujranwala District, Punjab.	Shot by Fateh Ali Shah. Data awaited from Moscow.
54294 E (Moskwa)	...	Garganey Teal (*Querquedula querquedula*)	......	♂	......	26-1-'39	Capt. L. D. W. Hearsey, Kheri, U.P.	Khajua Tal, Bhur Estate, Kheri District, U. P.	......
4202	24-2-'39	Common Teal (*Nettion crecca*)	Ghana Keoladeo, Bharatpur.	adult	Bharatpur Durbar	24-9-'40	Central Bird Banding Bureau, Moscow.	Environs of Ashkhabad.	......
4209	23-2-'39	Do.	Do.	adult	Do.	18-2-'40	Janglat Officer, Bharatpur (letter 1326 of 1940).	Bharatpur	One year later, in same locality.
10005 F (Moskwa)	June '29	Green Sandpiper (*Tringa ochropus*)	Environs of city of Kazan.	...	Central Bird Banding Bureau, Moscow.	...	......	Nr. Kottayam (Travancore).	......
32713 D (Moskwa)	16-8-'37	Gadwal (*Anas strepera*)	N. Kazakhstan, 20 km. from Ak-Suat Lake, on Syur-Karassu Lake.	Juvenile	Central Bird Ringing Bureau, Moscow.	30-12-37	......	South of Hadero, Sind Lower Indus.	......
206701 (Helgoland)	11-6-'30	White Stork (*Ciconia ciconia ciconia*)	Nr. Braunschweig, Germany (c. 52°16′N × 10° 30′E).	Juvenile (nestling)	Heligoland Biological Station.	Nov. '30	Bikaner Durbar.	Bikaner, Rajputana (78° N × 73° 15′E).	Found dead and in a dried up condition by edge of small lake.
27381 (Budapest)	30-6-'25	Rosy Pastor (*Pastor roseus*)	Village Novaj, N. E. Hungary (47° 55′N × 20° 30′E.)	Nestling	Royal Hungarian Ornithological Institute.	28-4-'26	M. J. Sheikh.	Lahore, Punjab.	......

114, *Apollo Street*,
Bombay,
31 *July*, 1948.

EDITORS

ABNORMAL BANANAS OF TRAVANCORE

II. A BANANA PLANT (*MUSA PARADISIACA* L.) WITH FOUR-BUNCHED INFLORESCENCE

BY

TRUPAPUR A. DAVIS

(*With 2 plates*)

INTRODUCTION

The banana is one of the oldest and most popular fruits of the world which is said to have originated from our own country. As an evidence of this we are still having some wild (seeded) banana varieties in the evergreen forests of South India and 'these might prove to be the ancestors of the innumerable popular varieties of the present day'. The banana is the cheapest and most common fruit in India probably next to the mango.

Next to coconut palms, every house in Travancore possesses a few banana plants in the fertile lands around it, since Travancore houses are unique in having enough backyard to produce most of the necessities of human life in. In a compound of one such house at Kannakurichy near Rajakkamangalam, South Travancore, the author came across a very interesting and extremely rare banana plant (*Musa paradisiaca* Linn.) which had given out a massive branched inflorescence.

Regarding variations and abnormalities in bananas the following peculiarities have been noted by different workers. Chandrasekaran and Sundararaj (1) have observed in one *sapientum* variety, Ney Mannan, three well developed styles instead of only one as in all banana plants. Variations in number and shapes of perianth parts have been recorded by Jacob (2). Dr. Mendiola (3) describes an interesting case of premature appearance of the inflorescence in a Latundal variety banana. An accident caused the premature appearance of the inflorescence. Mercado and Capinpin (4) report another case of the premature appearance of inflorescence in a Latundal variety in the Philippine Agricultural College banana plantations in 1927. The present author has also observed a similar plant at Alagappapuram, South Travancore. Twinning of the 'fingers' in the 'hands' is a hereditary character in the variety *Musa sapientum* var. *flabellata*. Undeveloped 'hands' in the bunch, formation of 'hands' at the staminate region, presence of differently coloured fruits in a bunch are also recorded by different authors.

The presence of a double sucker was observed by Jacob (5). A stalk with two flower buds was observed by Kander (6). Jacob (7) has found in a banana, variety Kali, the axis of which after normal bunching fasciated and produced a dozen different 'hearts' of pistillate flowers developing into innumerable dimunitive fruits while the original staminate 'heart' remained as such. recently there was a report in *The Hindu*, a South Indian daily, about an abnormal banana from Tanjore district, giving rise to two inflorescences. It will not be out of place to mention here the author's report of a five bunched inflorescence in a Mondan variety' (8). Mercado and Capinpin (4) who were working on the asexual inheritance of twin character of banana bunches, record one banana with twin 'hearts', four bananas with double stalks and one with triple stalk. The banana which is now being described is highly interesting in that it gives rise to four different inflorescences each bearing plenty of fruits.

PARTICULARS REGARDING THE PLANT

The abnormal banana plant belonged to one Rathnasami Nadar of Kannakurichy. It stood near the owner's house amidst a very thick coconut thope (plantation). When the plant was examined by the author in January 1947, it had reached the maximum growth and the four bunches had developed

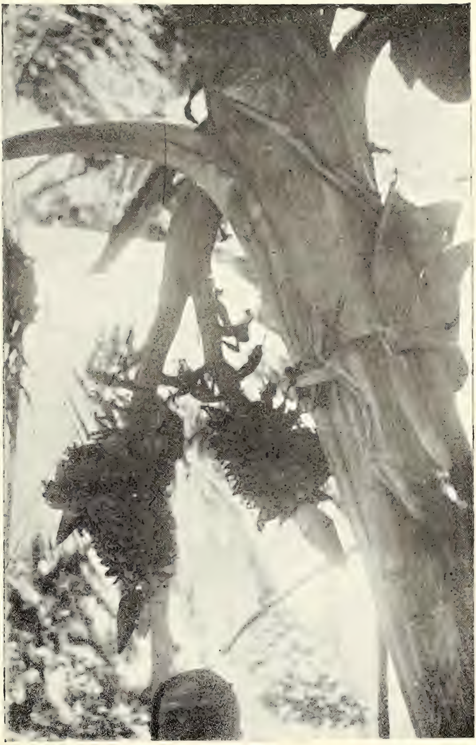

Photo by *T. A. Davis*

A *Musa* with four-bunched inflorescence.
Kannakurichy, S. Travancore.

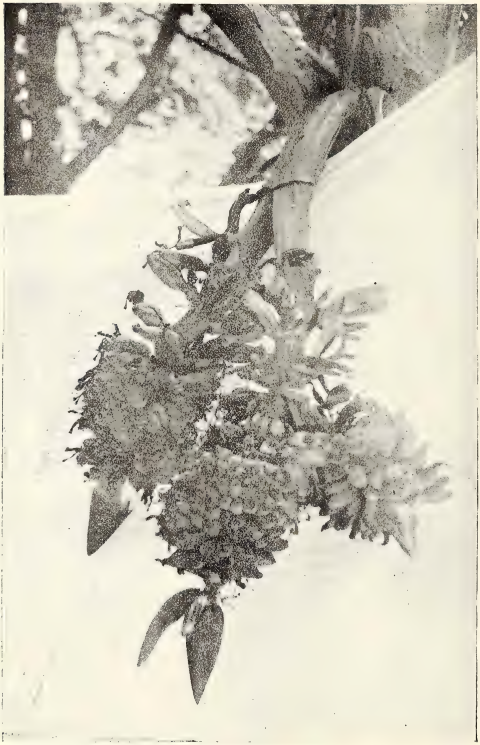

Photo by *T. A. Davis*

A closer view of the abnormal inflorescence with four bunches.

fully. The plant was nearly ten feet high from the ground level to the shot blade region. There were only ten healthy and normal leaves present at the time of observation. Only three daughter shoots were springing from the mother rhizome. As is the custom, the young shoots were cut away to inhibit their growth so that the mother plant might fruit well.

The variety of the plant was the common Peyan, a table variety. This abnormal plant as a young sucker was removed along with another sister sucker from the rhizome of a normally fruited Peyan mother from the same locality. The two young plants were transplanted in different compounds in the same village on the same day. This abnormal plant had started flower emergence at the fifteenth month, that is, towards the end of November 1946. But the sister banana had flowered four months earlier, that is, at the eleventh month of planting and the matured fruits were removed at the time when this plant had just emerged the 'hearts' (cone-like inflorescence). The inflorescence and the flowers of the sister plant were quite normal, typical of Peyan. Before the emergence of the 'heart' the plant under description resembled a normal one in all respects except the long delay in flowering.

DESCRIPTION OF THE BUNCHES

A careful examination of the abnormal plant showed that: The peduncle of the plant arising from the under-ground rhizome and covered by the pseudo stem of leaf-sheaths, is somewhat oval in cross section with a constriction in the middle of each flat surface making it clear that it is a combination of two peduncles. At the place of emergence of the inflorescence the constriction is seen very clearly since the grooves are deeper (vide Plates I & II). Another evidence to show that the peduncle is a combination of two, is the presence of two shot blades at the junction from where the peduncle emerges out of the crown of leaves. Both the shot blades are seen to arise from the same region each covering half the main peduncle, and each meeting the other at the grooves. From this junction the constriction is very prominent and the fusional stage is continued for a length of nearly thirty inches at the end of which they separate into two distinct branches as seen from Plate I. Two large bracts are seen to arise from this junction one on each branch. Plate II shows only one bract in a dried up condition, the other having already fallen away. From this junction the left branch (vide Plate II) continues its growth quite normally giving rise to nearly two hundred fruits. The first seven 'hands' in this bunch are quite normal with long enough internodes, ' and the fruits look that of normal Peyan. The remaining 'hands' are so compactly packed and the size of fruit so much reduced that for ordinary people they look a different variety of banana. The peduncle on the right gives off very healthy fruits numbering about eighty in eight 'hands' with normal space between the 'hands' as in ordinary Peyan bunch. At the ninth 'hand' the peduncle forks into two branches and both of them bear plenty of closely-set fruits. Of the two secondary branches the left one bears about two hundred fruits and its 'heart' goes on developing only male flowers. The other secondary branch on the right bears nearly one hundred and fifty fruits. Towards the end, this last branch forks into two branches again, each having a well-developed 'heart'. The final division is not so prominent and not visible in Plate II. The floral arrangement, shape and floral parts of this abnormal plant are quite normal. Though the four 'hearts' cut off numerous male flowers after producing the female ones, the barren stalks remain very short due to the failure of proper development of the internodal region of the peduncles. In short, the plant which appears normal except for the inflorescence, starts producing an almost double peduncle from the rhizome, which on emergence gives rise to two distinct peduncles in the beginning, one of which ends with the production of three bunches, altogether forming a four bunched inflorescence with four distinct 'hearts' producing the enormous number of nearly seven hundred fruits on the whole.

PROBABLE EXPLANATION OF THE FREAK

Normally a single sucker towards the end of the vegetative period after establishing a pseudo stem of leaf-sheaths, produces a peduncle which emerges outside and forms the inflorescence with a vigorously growing 'heart' which develops into a bunch of fruits. In the double sucker observed by Jacob (5) two small adjoining sprouts had started growth simultaneously from the under-ground stem.

The two shoots were enclosed by common leaf-sheaths so much so that they looked like a single plant till they began to separate. In the banana which Davis (8) recorded four different peduncles had originated from the under-ground stem. This may be due to the simultaneous development of four closeby shoots covered by common leaf-sheaths like the double sucker. However this also may be due to the early division of the single peduncle in the meristematic stage as a result of some external injury. Capinpin (9) who records a banana, a Bongolan variety with two fruit bunches, dissected the plant longitudinally and after observations reports that 'the two flower stalks (central fleshy regions) are placed side by side and may be traced in this fashion downwards to the corm (root-stalk). It is probable that the appearance of two distinct vegetative buds which are somewhat fused in the parent corm are developed into two separate stalks and then enveloped by the leaf-sheaths of the stem, gives rise to this case of teratological twinning '. Parallel to the preceding cases it will appear as though the present banana is a combination of two shoots. This is not likely the case here because (1) there is only one peduncle, visible inside the pseudo stem, though somewhat flattened : (2) even taking for granted that the peduncle is a combination of two shoots no such explanation is applicable for the further twice forking of the inflorescence. Probably due to the external stimulations or disturbances the meristematic tissue of the peduncle in the very young stage might have been hurt, and as the result of which it might have continued growth with different bits of growing points (apical meristem). Till the inflorescence has emerged, the growth in different directions was not possible as the compact leaf-sheaths do not give room for such lateral growth. As the main peduncle has emerged it has grown in two directions in the beginning, and one of them again repeated the phenomenon in three directions according to the position of the bits of the ruptured meristematic tissue. Thus the single peduncle has resulted in the formation of four different bunches with four distinct ' hearts '. Local enquiry shows that the plant has received at a certain period severe shocks due to the falling of coconut fruits and leaves on it during harvest from the palms which surround the banana plant on all sides, which might have ruptured the meristematic tissue in the young stage. It may also be reasonble for one to surmise that the branching of the peduncle may be due to the earlier attack of certain insect pests, especially the borers. But not even a small trace of such insect attack is seen in any part of the entire inflorescence or on the plant itself. Moreover, the branching of the peduncle is so regular (a case of dichotomy, a phenomenon common among cryptogamic plants) that one can mistake it for the after-developments due to insect attack. In the case of the fasciated inflorescence reported by Jacob (7) the single peduncle after producing the fruits has come across with some external injury as a result of which and with the help of the excess nutrition available it has produced a very irregular and highly complicated structure with numerous small fruits and a dozen different ' hearts '. The present banana is far different from these complications by having a regular and true dichotomous branching of the first, second and third order.

A peculiarity with the fruits of this abnormal bunch was that all of them did not look alike. Though they had not matured when the plant was examined, still the difference was clearly seen from the contrast in sizes. The first nearly 80 fruits of the right peduncle (the one with three branches) and the first seven ' hands ' of the left peduncle, Plate II, were very big and looked exactly like the normal Peyan fruits. In between the ' hands ' of these regions, normal internodal spaces were maintained for the proper maturity of the fruits. All the other fruits from the different bunches remained small (shorter and narrower) and were very closely packed. More careful examination of the fruits and the young flowers confirmed that even the smaller fruits were identical with normal Peyan, though at a casual glance they looked a different variety—Rasthali. Another peculiarity about this inflorescence was the presence of very short internodes except between the first few ' hands ' as mentioned already. This is rather inexplicable. McWhorter (10) gives an explanation of this dwarfing of the peduncle about Dr. Mendiola's banana which had a premature exposure of the inflorescence caused by an accident. He says that ' the early exposure to light may be largely responsible for the changes produced. It is well known that light produces a marked formative effect on any plant or plant-organ. In general it may be stated that the longer the exposure to light of a developing organ the shorter the internodes. . . . Early exposure of the inflorescence necessitates increased exposure to light at a time when the organ is in a critical period of formation.'

This can hardly be the possible explanation in the present case, because (1) instead of premature exposure this plant had a very late emergence of inflorescence (by three to four months) : (2) the plant was unable to get even normal light since it was growing under a thick coconut plantation : (3) there is inequality regarding the internodes in the same infloresence.

Is the multi-bunching character a heritable one ?

It is pertinent for one to ask whether the daughters of this plant will imitate the benevolent mother or not. In this connection it is very interesting to see Mercado and Capinpin's (4) work. They record the degree of asexual inheritance of the twin character of Cambal Banana. The plant was from Panitan, Capiz, which had given out a double bunch in a stalk. The clon was then split and the subclons planted. The following table gives the details of the four matured subclons.

Production of single, double and triple bunches of 'Cambal Banana'

Clon	No. of fruiting stalks.	Single bunch stalks.	Double bunch stalks.	Triple bunch stalks	Total production bunches.
Original clon	2	1	1	0	3
Sub-clon 1	3	3*	..	..	3
,, 2	1	..	1	..	2
,, 3	2	1	1	..	3
,, 4	3	1	1	1	6
Total ..	11	6	4	1	17

Since the four subclons from the original plant possessing twin bunch character, produced triple, double, and single bunches in the following asexual generations, there is therefore an indication that the twin-character of the original plant is inherited vegetatively. Neither Jacob (5) and (7), nor Kandar (6) make any mention about the inheritance of double branching in their observations. A careful enquiry made about the flowering of the subclons of the five-bunched banana reported by Davis (8) gives any confirmable results with that of the Cambal Banana described above. Regarding the present banana, the author regrets to say that the banana was not available for further personal studies as it was refused for price. Still instructions were given to the owner to transplant the subclons carefully and to report the results in due course.

The superstitious people around the locality who find the manifestations of God everywhere hold this plant in veneration and make offerings for its blessings. It was a source of attraction for many nature lovers.

Acknowledgment

The author expresses his sincere thanks to Mr. K. Cherian Jacob, L. Ag. F.L.S., who was kind enough to go through the manuscript.

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* One of the bunches had twin 'hearts'.

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ABNORMAL PALMS OF TRAVANCORE

IV. POLYCARPY IN A COCONUT (*COCOS NUCIFERA* L.)

BY

TRUPAPUR A. DAVIS

(*With 2 plates*)

INTRODUCTION

The existence of coconut palms has been recognised from prehistoric times. India seems to be the original home of the coconut and it has the largest area under coconuts followed by the Philippine Islands and Ceylon. Nearly ninety per cent of the coconut area in India is concentrated in South India, and Travancore shares a very large percentage in it. In Travancore the area under coconut cultivation and the income derived from it surpass any other crop plant. It is the pride and wealth of the people. Extensive uses of this distinguished member of the palm family have been recognised from very early days, and it is no wonder that in Sanskrit the coconut is called the " Kalpavriksha ", the tree which provides all the necessities of life. As Patel (1) puts it 'in the domestic economy of the inhabitants of the tropical countries, every part of the coconut tree is utilized in some manner or other'. In the following paragraphs the author describes a coconut fruit with the original three carpels well developed, each giving rise to a healthy and quite normal-looking seedling which he has observed in a village near Rajakkamangalam, South Travancore.

DESCRIPTION OF THE " SEEDLING "

The following details regarding coconut fruit as given by Hooker (2), Gamble (3) and Furtado (4) will be helpful in explaining this following abnormality.

The female flower of *Cocos nucifera* L. is usually much larger than the male. It is ovoid and the perianths are greatly accrescent; sepals imbricate, petals short, convolute with imbricate tips. The ovary is three-celled, two of which usually become abortive at an early stage of development, only one attaining maturity. The fruit consists of a thin outer skin or epicarp, below which is the thick fibrous mesocarp surrounding the hard shell or the stony layer of the nut. This shell is formed mainly of endocarp, but the outer integument of the seed is also represented in it as a lignified inner lining of the shell, (Juliano) (5). Inside this stony layer is the solid endosperm which is commonly called the kernel or the 'meat'. It is lined outside by a thick blackish coating. This coating which we call testa is derived from the inner integument of the ovule according to the theory of Juliano. Then comes the cavity partially filled with water or 'milk' in ripe coconuts. Corresponding to the three carpels of the ovary there are three markings or 'eyes' on the endocarp, two of which become hard, after the degeneration of the two cells of the ovary, while the third 'eye' of the devloped cell remains soft. Just beneath this 'eye' is the embryo. When the germination sets in, a suctorial organ, haustorium or

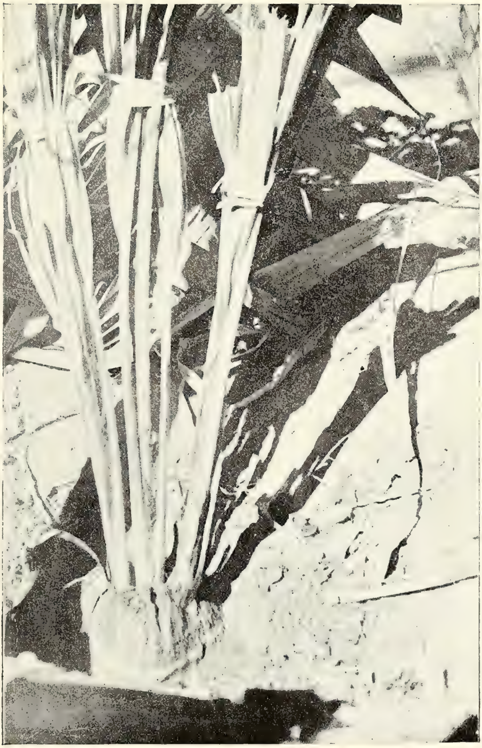

Photo by *T. A. Davis*

A coconut fruit giving rise to three shoots.
Kannakurichy, S. Travancore.

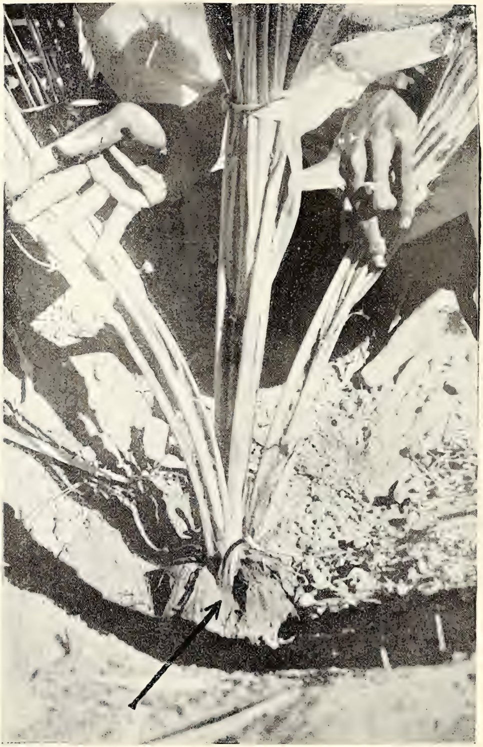

Photo by *T. A. Davis*

The abnormal coconut fruit with the husk partly removed to show that all the three 'eyes' are fertile.

'foot' develops into the cavity at the end of the cotyledon of the embryo, which supplies nutriment to the young growing plant by absorbing it from the endosperm.

Plate I shows an interesting coconut fruit giving rise to three shoots. When the plant was examined and the photograph taken in January 1947, the plant was nearly sixteen months old. Along with hundreds of ripe nuts this fruit was also planted for germination. As soon as it sprouted, the owner, Sri Vairavanatha Nadar of Kannakurichi was able to observe the peculiarity of three healthy and normal looking shoots coming from one and the same fruit. After nearly ten months, this seedling was transplanted near the owner's house on an open area supplying all the requirements for the tender plant. Enquiry reveals that all the sprouts of this nut emerged almost simultaneously. The three shoots appear to stand almost in a line, Plate I. But this is strictly not the case at the place from where they start growth. In order to verify whether each shoot arises from a separate 'eye' or all from one 'eye' or whether the shoots are due to a very early branching as in suckering palms, the fruit was partly de-husked. Since the husk at that time was in a rotting condition it was possible to remove some portions of the fibrous layer with the hand up to the 'eye'. Plate II shows one such cavity made just at the very foot of one sprout. From the same plate we can see one 'eye' and the shoot coming from it since the whole husk above that 'eye' is removed. Similarly, the other two 'eyes' were examined and it was found that all the three 'eyes' were quite fertile each giving rise to a shoot. The shoots formed a triangle between them towards the shell though they stand almost in a straight line after emerging from the husk. Unfortunately the coconut was refused for price or favour and hence the inner details of the fruit could not be studied. When the plant was examined, five leaves were seen on each seedling and they showed a uniform height of nearly five feet. The growth of the sprouts from the young stage and the size and appearance of the individual seedlings are identical with a normal seedling. The plaited condition of the leaves was just beginning to disappear, since they began producing free leaflets. Periodical observations can be had from the particular palm since it is planted well to see the later developments.

The ovary of the *Cocos nucifera* is three celled, two of which usually become abortive, at an early stage of development, only one attaining maturity. Thus a normal nut is having only one chamber and only one embryo situated just beneath the soft 'eye'. The other two blind 'eyes' which represent the two aborted carpels, are very hard and do not possess any embryo. In rare cases two 'eyes' remain fertile, each representing a developed carpel. Jacob (6) describes a bi-cellular coconut thus "In this there are within the single outer covering two chambers separated by a thick septum of endocarp. Each of these chambers has its own endosperm and embryo. Of the three 'eyes' on the endocarp, the two corresponding to the fully developed cells are large and soft, while the third corresponding to the undeveloped cell is small and hard. If this coconut had been planted, two seedlings would have been produced." At the Agricultural Research Station, Kasargod, there are two trees developed from a single nut. These are about thirty years old and are bearing normally. Furtado (4) mentions about a coconut palm which, has three distinct individual stems from the base. It is said that the three stems have originated from one coconut fruit planted in 1901. Only two stems were bearing while the third remained barren. There was another similar palm with three stems in the Botanical Gardens, Cooly Lines, Penang, which have also originated from one coconut fruit. In a private compound at Burma Road, Pulan Tikus, Penang, there is an old tree which has two stems, distinct from base. Both are fruiting. Quisumbing (7) has seen in the Carnival held in Manila in 1926 two seedlings of coconut exhibited by the Province of Palwan. The first seedling had two shoots and the second three shoots. The author hesitates to assign all these cases to polycarpy since they may also be due to (1) polyembryony and (2) premature branching of the single shoot.

POLYEMBRYONY AND POLYCARPY IN COCONUT FRUITS

Polyembryony is the development of more than one embryo from one ovule. It does occur in coconuts beyond doubt. Furtado (4) describes a few cases of poly embryony. There was exhibited in 1925 at the Taiping Agricultural Show a germinating coconut from Pampong Jelutong, North Perak, which had put forth three shoots. The coconut was carefully husked to find the three shoots as distinct individuals as far as the soft ' eye ' through which they had extruded from the endocarp. The two other ' eyes ' were closed and as hard as in ordinary nut where two carpels are abortive. On breaking the nut open it was observed that each shoot had its origin in a separate embryo, each having a cotyledon and a haustorium of its own. There was only one cavity in the endosperm into which these three haustoria had developed, and there were neither hard nor leathery dissepiments in it which are said to be present in a polycellular nut. The kernel inside also showed no signs of any special connection with the closed ' eyes ' as it showed with the soft ' eye '. This is a genuine case of polyembryony in coconuts. Furtado has also examined such specimens having two or three embryos from Singapore, Pennang and Malacca which go to prove that polyembryony does frequently occur. These shoots may emerge out of the husk in all directions and often in such wise as to mislead one to think that these extra shoots are due to the functioning of more than one ovule.

Costerus and Smith, quoted by Furtado, describe a case of polyembryony thus—" The coconut is one which had given rise to three sprouts and which, on being carefully opened had not shown any dissepiment whatsoever. Only one germinating plant forcing its way through one of the black spots was to be seen, but the stem of this young plant showed a separation into three." However, the present "seedling" which is being described is neither a case of polyembryony nor of premature branching, since the three shoots develop, one from each of the ' eyes ' which are fertile (soft & broad). It is expected to have three cells inside the nut each representing a developed carpel which must be the natural condition. Thus it is a case of polycarpy and not polyembryony. In this connection it is interesting to know that some abnormal coconuts with more than three cells are recorded, the exact cause of which is not known. Forbes, quoted by Furtado (8) has seen nuts with cells ranging from four to eight and ten. He made a sketch of a tree which had come up from a nut of fourteen cells, all of which had germinated, producing a tree with fourteen stems united at the base. If Forbes's conclusions as to the occurrence of more than three cells in a nut are correct, then the phenomenon concerned might be a case of vegetative multiplication of carpels. If, on the other hand, his conclusions were based merely on the number of shoots that appeared on germination of a nut, then three alternatives are possible :—(1) that the numerous shoots are due either to the occurrence of polyembryony : or (2) to the fasciation of the plumule, or (3) to the monopodial branching with very much abbreviated axis.

ACKNOWLEDGMENT

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THE USE OF THE BARK OF *STRYCHNOS NUXVOMICA*; LINN., IN POISONING A CROCODILE

BY

A. R. K. Zobairi

(*Communicated by Lt. Col. E. G. Phythian-Adams, I. A.* (*Retd.*))

There is no gainsaying the fact that the extermination of enemies of fish especially from fish sanctuaries should be the chief concern of those interested in fish and fish culture. Of all the several animals that prey upon fish the crocodile is indisputably the largest and the most difficult to reckon with.

The crocodile though not entirely a piscivorous creature appears to show a predilection towards this diet when it is available in sufficient quantity and therefore it becomes a permanent resident in stretches of water where fish abound causing incredible damage to the fisheries. In the Cauvery River, for instance, large congregations of fish occur below the Hogainkal Falls about 30 miles up from the Mettur Dam, which happens to be an insurmountable barrier for the migrating fish during most of the year excepting when the river is in spate. Fish conservancy laws are enforced here prohibiting all types of fishing for about 2 miles down the river. This region has unhappily become the abode of the Mugger. Large numbers of these beasts are seen here anytime of the day lazily swimming in the river or basking on rocks or banks with appalling unconcern. The periodic hunting expeditions of shikaris interested in crocodile shooting to this place do not appear to have helped much in eradicating this leviathan pest from one of our most important fish sanctuaries.

These crocodiles seem to subsist mainly on fish like large catla, cat fish and other carp which swarm in this region in countless numbers. They frequently migrate down as far as the Mettur Dam, so much so, that the entire Stanley Reservoir could be said to be infested with these reptiles. Even below the dam one is apt to see them anywhere in the river, predating on fish which migrate upstream in dense shoals only to stagnate in the face of the dam. People of these neighbourhoods are therefore encouraged by the Department of Fisheries to annihilate the monsters by offering rewards for every crocodile killed.

There are two popular ways by which the crocodile is generally done away with in the Stanley Reservoir and in the Cauvery River below the Mettur Dam. These are: (i) hooking and (ii) poisoning. Shooting is of course indulged in as sport by an interested few. In the present article the material and method employed in poisoning Mugger is discussed, which being the most effective and easy way of decimating this enemy of fish it is felt may be of interest to those faced with this problem elsewhere.

MATERIAL EMPLOYED

The material that is used as poison is the bark of *Strychnos Nuxvomica* Linn. (Tamil: *Yetti*, *Yettimaram* or *Yettikottai*; Telugu:

Mushti, *Musidi*, *Induppu*; Kanarese: *Kasaraka*, *Kujarra*, *Khasca*, *Kasaragadde*, *Mushti*; Hindi: *Kuchla*, *Kajra*, *Nirrual*, *Chilibinge*, *Bailwa*.)

This is a tree found throughout tropical India upto an altitude of about 4,000 feet, common in Madras Presidency, attaining a height from 35 to 50 feet. It can easily be identified by its ovate, five-nerved, glabrous leaves (3½″ × 2″), yellow berries 1½″ in diameter with one or more seeds, 7/8th inch to one inch diameter and ¼″ thick. Seeds are flatish concavo-convex, rounded at the margin, marked on one side by a central scar whence a projecting line passes to the margin ending in a slight prominence. Externally they are of an ash-gray colour glistening with satiny hairs, internally horny somewhat transluscent without any odour but with an extremely bitter taste.

The Nuxvomica tree is of great economic value mainly for its seeds which are put to diverse medicinal uses all over the world. They are exported from India to the United Kingdom in large quantities annually for the manufacture of strychnia chiefly used for the preparation of nervine tonics.

In India itself the seeds in different combinations are used as a medicine for dyspepsia and diseases of the nervous system. On the Malabar coast the root is given in cases of snake bite. In Konkan small doses of the seeds are given in colic combined with aromatics, and the juice of the fresh wood is given in doses of a few drops in cholera and acute dysentery. The oil from fresh seeds is used as an external application in chronic rheumatism. Nuxvomica seeds produce a sort of intoxication for which they are habitually taken by some as an aphrodisiac. The seeds of Nuxvomica which contain 0·2 to 0·5 per cent strychnine and 0·12 to 1 per cent brucine are commonly used as fish poison. These are pounded and thrown in water when all the fish come up to the surface in a state of intoxication. The leaves of the plant broadcast in water produce the same effect on fish life. In European medicine it was first known about the middle of the 16th century when the chief use of its seeds was for poisoning cats, dogs, crows and ravens.

METHOD OF POISONING A CROCODILE

Advantage is taken of the fact that a crocodile as a rule prefers decomposed meat, specially fish, to fresh. It is known to be attracted from long distances by the stench of putrified fish. Chippings of the bark of Nuxvomica are pulverised by pounding, care being taken to tie a piece of cloth round the mouth and nose to prevent the dust from getting in as it is supposed to be very poisonous even if inhaled. About 8 ounces of this powder are stuffed into a fish, preferably a carp weighing about 1½ to 2 pounds which has been gutted by making a small incision in its belly. The slit is sutured up and the fish kept on the bank or on some rock above water in such a way that the poison does not trickle out and foul the water. This is done some time after dusk to prevent other animals from devouring it and coming to grief. The crocodile attracted by the taint of the dead fish, which does not take long to putrefy makes straight for it and swallows it. It dies during the course of the same night and its carcase is usually found floating somewhere near about the next morning.

Seven crocodiles were bagged in this fashion during the course of three months in the Stanley Reservoir. All these had died so instantaneously, that the fish stuffed with the poison was found intact inside their stomachs; the little amount of the Nuxvomica bark powder that may have oozed out in solution through the stitches having done its work.

The advantages of this method of killing a crocodile over either hooking or shooting it are : (i) the animal dies and floats up quickly so that the carcase is available for skinning before any decomposition has set in, (ii) the method involves practically no expense save the cost of one fish which is low enough, (iii) it needs no elaborate arrangements and no labour, (iv) it is infallible. A crocodile dives deep down the first thing it is shot and expires under water if the shot has been well aimed. Usually it will be days, perhaps weeks before its carcase comes up, by which time decomposition will have affected even its hide and ruined it as a trophy. It is a different matter if the crocodile has been shot when it is well up on land or the shot so lethal that it anchors the animal to the spot and gives it no chance to get away into distant depths. Such opportunities are of course always rare.

If a crocodile is to be baited and hooked, apart from this method involving the element of chance, the bait has often to be replenished more than once before the animal actually gets hooked, for, it generally manages to make off with the bait without touching the hook. The bait which is either a large dead fowl, a lamb or the entrails of sheep, becomes a comparatively expensive proposition if it has to be repeated a number of times for the same crocodile.

There is only one precaution that has to be taken if the crocodile has been killed by poisoning ; its meat should be buried deep down or destroyed in some other way and people should not be allowed to consume it in any form. Usually when the news goes round that a crocodile has been killed people flock immediately and virtually pick the bones of all flesh which they preserve by converting it into fillets and sun drying. This dried meat is used as a remedy for whooping cough in children. A small bit of it is made into a thin soup and administered. Some people soak this dried meat in brandy and drink the liquor in cases of asthma. The meat of a poisoned crocodile appears to be dangerous to all life. A healthy pariah dog that was inadvertantly allowed to eat a small bit died within four hours of taking it with pitiable convulsions and in excruciating agony.

REFERENCES

1.—Watt George—Dictionary of Economic Products of India, Vol. VI, Part III (1893).
2.—Bailey, L. H.—Standard Cyclopaedia of Horticulture (1919).

REVIEWS

1. THE MAN-EATING LEOPARD OF RUDRAPRAYAG. By Jim Corbett.

Pp. 157, Frontispiece+10 black and white photo illustrations. Front and end inside-cover maps. Size 9″×6″. Oxford University Press (Indian Branch). Price Rs. 6.

This account of hunting the dreaded Man-eating Leopard of Rudraprayag to a finish is a real-life thriller which will be eagerly read by a wide public in many countries. Especially will it be valued by those who possess the 'Man-eaters of Kumaon' which was reviewed in Vol. 45 of the Society's *Journal*.

It is a shikar thriller which invites the reader to a full exercise of his imagination. He can picture to himself the wildly beautiful mountain and forest scenery; the pleasing, hardy hill folk; the rushing ice-cold waters of the two famous rivers; the long years of nightly terror brooding over the land; the stark realities of the many killings and the lamentations of the bereaved people. And those who know the rugged, mountainous country of Garhwal will vividly appreciate the difficulties of terrain with which Jim Corbett had to contend.

The reader is given an interesting description of the famous pilgrim route from Hardwar to Badrinath, which winds through the wayside hamlet of Golabrai to pass beneath the mango tree (shown in the photograph at page 145) where the final scene was enacted on the night of 1st May 1926.

The end map indicates the country comprising some 500 square miles in which more than 125 killings took place during the years 1918 to 1926. 'When night came an ominous silence brooded over the whole area—no movement and no sound anywhere. No curfew has ever been more strictly enforced, and more implicitly obeyed than the curfew impossed by the Man-eating Leopard of Rudraprayag.'

The author first had news of this leopard in April 1925 and went to Rudraprayag. All methods known to him, and others devised during the first ten weeks of his first hunt for the animal, were tried by himself when alone, and jointly with his friend Mr. Ibbotson (the then Deputy Commissioner) when they were together. There were failures due to various causes, and bitter disappointments. In the years 1925/26, the author mentions, that the use of the electric torch for night shooting had not become very widely known. But some shikari readers will recall that good torches were available early in 1925 and be thinking that Corbett could have given more thought to the imperative need for aid to night shooting for his purpose, and devised, as some did about that time, the use of a cycle lamp with 3.8 watt bulb, operated by a push button on his rifle, or in some other handy position. The incident at the walnut tree at pages 36/39 is an instance of when the use of such a lamp fixed high up in the tree would have insured success.

Poisoning of kills with cyanide, also with strychnine, was tried without success. In 1923 the well known and authoritative book, *Wild Animals in Central India* by Dunbar Brander, was published and reviewed in the Society's *Journal* the following year (Vol. 29). At pages 41 and 42 of that book correct methods for the successful use of strychnine for poisoning 'kills' are described. The strength of the emulsion is not there given but it is important. Eleven grains to the pint of water is the correct dilution. It is a pity this formula was not known to the District Officers issuing poison to the village officials at that time, nor to the author. Many lives would have been saved. All sportsmen will be of one mind with Corbett at page 28, 'Truth to tell I hated the very thought of using poison then, and I hate it no less now.' All recognise that; but its use in such cases is justified when other methods fail.

The use of a powerful steel gin-trap almost succeeded. The happening related at page 52 confirms the invariable habit of your reviewer never on any account to have a companion on such vigils. One knows one's own capacity but not that of another, whoever he may be.

At page 27 is described a method used by many villagers to kill leopards for profit. It is the insertion of a small and very highly explosive bomb in the flesh of an animal killed by a leopard. 'Many villagers have learnt how to make these bombs, and when one of them comes in contact with the leopard's teeth, it explodes and blows the leopard's jaws off', but it is not necessarily fatal at the time. Needless to say that Jim Corbett did not for a moment consider this way of dealing with the man-eater, and it is to be hoped it will not become known in other parts of this country. It has never before been heard of by your reviewer. Doubtless the Society will report this malpractice to the proper quarters.

After ten exhausting weeks a rest was necessary, so the author left the scene in the autumn to return in the spring of 1926. The 'Fishing Interlude' will be enjoyed by readers, and those who are keen anglers will be interested to know that the Gohna Lake is now one of the best trout fishing areas in India.

At one time when convinced that the leopard was south of the Alaknanda, it occurred to Corbett that it might be advisable to close the two bridges and so very greatly narrow down the field of its operations. That very sound move was the cause of eventual success when the scales of fortune were so evenly balanced on the night of 1st May that it was a mere fraction of time *after* the fatal bullet had sped that the bulb gave out!

Some of the author's observations are useful to sportsmen. He rightly stresses the many failures which happen through wrong estimation of the intelligence of the larger carnivora and their superhuman senses of sight and hearing. The aid of birds and lesser beasts in affording valuable information is also demonstrated. In the Society's *Journal* is an excellent article by Colonel Toogood (Vol. 38, p. 814) on sound listening for the purpose of locating a tiger.

The author stresses several times that the leopard 'has no sense of smell'. That is a rather dogmatic assertion. All cats have a sense of smell which is more developed in some than in others. The domestic cat has a good nose, and the civet cat can run a trail as well as a dog (Stuart Baker, Vol. 27, p. 117). A panther climbed to an empty machan where the body of a dog it had killed had been removed to be out of his ken (Vol. 28, p. 789.). Your reviewer has seen a panther come trotting through the open teak forest having evidently scented the tiger's kill of which he could have had no previous knowledge, and has made other observations which show that panthers can, and on occasion, do use their noses. Dunbar Brander writes on p. 135 of his book, 'The leopard's sense of smell is poor, but better than the tiger's, and I have seen them using their noses.' It was probably due to his sense of smell that the leopard selected the Garhwal woman thought to be protected by the store-room at her back and several rows of plains pilgrims sleeping between her and the front of the shed (p. 142).

'When a leopard or tiger (p. 139). is walking at its normal pace only the imprints of the hind feet are seen. . . .' This is not altogether correct. Such generalities or positive statements are not safe. It is a proved fact that sometimes a tiger will leave a single track and sometimes a double track. As to leopards, these animals like the tiger usually leave a double track with the hind foot leading. So says F. W. Champion in his carefully tabulated article at pages 284/287. Vol. 33, with which are clear photographic plates showing double track of tiger, single track of tiger, and typical double track of leopard. At page 972 of Vol. 33 Dunbar Brander writes with reference to Champion's article. 'In my opinion, the normal action of a tiger walking is exactly as Mr. Champion describes . . . . the hind foot oversteps the position of the forefoot.' Readers interested should see the references here quoted.

The tale is clearly and simply related. The book is well bound and printed. Some readers would have liked the numbering of the chapters to be in Roman numerals, or in words, and not in ordinary numbers as for the pages.

The author has once again earned the gratitude of the hill people, and of the public for this thrilling tale. His closing paragraph praises the 'big-hearted sons of the soil, no matter what their caste or creed, who will one day weld the contending factions into a composite whole, and make of India a great nation.'.

R. W. B.

2. TREES OF INDIA. By Charles McCann. Pp. 141, 78 coloured plates, 17 text figures. Size 5″×7″. Bombay 1947: D. B. Taraporevala Sons & Co. Price Rs. 13.

This book has been a real pleasure to read particularly because the author is a very thorough and born naturalist and zoologist in addition to his specialised work in the field of Botany. I have had the pleasure of 'Charles's' company on many of my entomological collecting expeditions in the past when his amazing knowledge and sure sense of direction in the jungles have proved of the greatest assistance and contributed in no small measure to the success of those efforts.

It is therefore small wonder that he chose to set out in his usual exemplary manner his beloved trees and I suggest that the book will be of the greatest help to the student particularly because of the specialised, yet simplified arrangement of the wealth of information contained.

The preface is interesting and I hope any future translations will follow the author's request for nomenclature; however I feel that the colour reproductions fall short of the author's personal handiwork which I had the pleasure of viewing on several occasions before the book approached publication, possibly as a result of shortage of correct materials due to post-war conditions.

Pages 11 to 54 contain very useful information of a general character and of decided value to the student.

I consider the arrangement and information given of each tree described typical of the author's high standard of work making a most useful reference book and worthy of a place in everyone's library.

J. I. A.

The following books have been added to the Society's Library*:—

1. TREES OF CALCUTTA AND ITS NEIGHBOURHOOD. By A. P. Benthall (Thacker Spink & Co. Ltd., Calcutta, 1946).
2. INSECTS AND HUMAN WELFARE. By Charles T. Brues (Harvard University Press, 1947).
3. THE COMMON BIRDS OF INDIA. By Eha (Thacker & Co. Ltd., —3rd edition, 1947).
4. INSECT NATURAL HISTORY. By A. D. Imms, M.A., D.Sc., F.R.S., (Collins, St. James's Place, London, 1947).
5. BRITISH SEA BIRDS. By C. A. Gibson-Hill (H.F.& G. Witherby Ltd., 5, Warwick Court, London, W.C. 1).
6. THE BOOK OF INDIAN ANIMALS—INDIAN NATURAL HISTORY SERIES VOL. II. By S. H. Prater (Bombay Natural History Society, Bombay, 1948).
7. PRE-HISTORIC LIFE. By Percy E. Raymond (Harvard University Press, Cambridge, 1947).
8. A HISTORY OF FISHES. By J. R. Norman, F.L.S., F.Z.S., (Ernest Benn Ltd., London, 1947).
9. ECOLOGICAL CROP GEOGRAPHY. By K. H. W. Klages (The Macmillan Company, 1942).
10. FOUNDATIONS OF PLANT GEOGRAPHY. By Stanley A. Cain (Harper & Brothers, New York and London, 1944).
11. LIVING LIGHT. By E. Newton Harvey (Oxford University Press, 1940).
12. THE OCEANS. By H. W. Sverdrup, Martin W. Johnson and Richard H. Fleming (Prentice Hall, Inc., New York, 1942).
13. MITOSIS. By Franz Schrader (Columbia University Press, Morningside Heights, New York, 1946).
14. THE BIRDS OF BOMBAY—BOMBAY CITIZENSHIP SERIES. By Salim Ali (National Information & Publications Ltd., Bombay, 1948).
15. THE BIRDS OF BURMA—BURMA PAMPHLETS NO. II. By B. E. Smythies (Longmans, Green & Co., 1948).
16. THE BIRDS OF NORTHERN THAILAND. By H. G. Deignan (Smithsonian Institution, United States National Museum, 1945).
17. THE MAN-EATING LEOPARD OF RUDRAPRAYAG. By Jim Corbett (Oxford University Press, 1948).

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* No. 5 by courtesy of the author, Nos. 9-13 inclusive that of the American Library Association, and No. 16, of the Smithsonian Institution, Washington.

MISCELLANEOUS NOTES.

I.—A MAN-EATING TIGER OF THE KOLLEGAL DISTRICT, SOUTH INDIA.

On this occasion—August 1947—I failed to kill the tiger, but can say with certainty that his dentition is much the same as that of the Nelliampathies animal over two hundred miles further south (Vol. 47, p.148). There was every expectation that the S.W. Monsoon would as usual give little rain to the Minniam valley, which is protected by the Biligirirangan Hills as is the Bhavani valley by the Nilgiris. Most unfortunately this was an unusually heavy monsoon and that saved the tiger.

There are five or more tigers in the valley and the surrounding hills but there was no useful information, sex or anything else, as to identity of the beast which had killed two herdsmen in January 1946, another man in April and a woman on 3rd July.

Having pitched camp near Minniam village and obtained two cows (people in South India raise no objection to use of cattle as 'baits' and readily supply old and useless dry cows—at a price !) one was picketted 2 miles south and the other 4 miles east. Tigers and panthers of the area seem to slay about four animals a week—they did during my stay, and as the herdsmen at once raise a tremendous uproar to drive the beast away, and the chamars and other harijans—there are 30 houses of these in Minniam village—skin the slain cattle and cut up the carcases, the tigers know there will be nothing left and have acquired the habit of not returning to such 'kills'.

This I discovered after a fruitless all-night vigil over a lovely young snow-white cow slain about mid-day on the 2nd August. On the night of 3rd the east bait was taken by a panther which I failed to slay owing mostly to a great thunderstorm early in the evening—the precursor of a number of such, which soaked me through and through. Fortunately the weather was warm (valley elevation 1900 ft.) and all of my clothing, also the blanket draped over me was of wool. Why I did not get the shot I should have had would take too much space. We must get to the tiger.

The place for the south cow was selected after arrival in camp on 30th July because of fresh tracks of a tiger and tigress in bed of the ravine, a good approach to tree selected for machan chair, and a convenient root for the tethering wire rope: also there was water for the poor cow. Having got out of wet clothes on the morning of 5th August a visit to the ancient cow showed that a male tiger had passed up the ravine early in the day within twelve feet of the bait without molesting it. Experience taught the tiger would return that night or the next and take the offered dinner. He was evidently a wary animal, similar to a number of others like him which I have defeated from time to time, and some others which have defeated me.

That night I could not be in the machan, which had been fully prepared since 30th July, as all my kit had to be dried. Next morning it was found the tiger had not returned. Now it was certain he would return this night—the night of the 6th.

It was not known if he was the wanted animal, and as an immense storm gathered at the head of the valley and I felt certain of a shot on the following night should he kill the cow, I did not occupy the machan. That, over-confidence and the seeming certainty of a tremendous deluge saved the tiger. Alas! the storm miraculously worked away to the west and gave but little rain to that valley and ravine. In the morning—7th—it was found that the tiger had attacked the poor cow and been unable to kill it. Marks on the neck showed want of effective canine teeth, and claws were evidently none too good. The cow's off stifle had been munched and the skin broken, but the flesh only gnawed and not eaten. Return of the tiger seemed a certainty; hope was high and there would be no rain.

Before 3.45 p.m. all was quiet. At 5 o'clock a tremendous roar a long hundred yards down the ravine was followed at intervals by other similar loud, angry demonstrations five or six times repeated up to six o'clock when a last one of less volume from a slightly altered direction; and then complete silence. I have known tigers returning to 'kills' growl and grumble, but never experienced such a noisy animal as this. It was suspected in the morning that he was not far away and maybe knew that men had looked at the cow, also, perhaps he may have heard me getting up the rope ladder and settling into the machan; and he may have got my wind as the slight air movement down the ravine was in his favour. Anyhow he was not behaving in a normal way: perhaps he was following his experience with timid herdsmen. The one unavoidable defect of this selected place was that it was possible for the tiger to be within hearing distance of it.

All previous tracks had been along the other, the right side of the ravine bed. Now, just after dark, I thought I heard a slight click of a stone on my side. Nothing further during the night and no approach to the cow.

In the morning it was found the tiger had come up the left side and had actually stood almost beneath my machan on a small patch of sand. Why he did not go the further thirty feet to the cow will never be known. May be he saw the cow to be alive and knew he could not kill it; previously he had not shied off taint of men in the nala; the machan was well screened and high up; I was quite silent and had not eaten for fear of any slight sounds reaching microphone ears. Padded chair arms, padded foot rest and shooting bar, all clothes of wool; he could not have detected my presence, and had he done so would not have ventured beneath me.

I entirely removed the machan and placed it in a more distant tree but on nights of 8th and 9th he did not return. The cow was still alive. On the 10th news came of a cow in grazing herd killed two miles further up the ravine. This was the work of a normal tiger and I had another fruitless vigil. Two days later severe conjunctivitis in the right eye and increasingly bad weather decided me to break camp and own defeat on this occasion both as to the tiger and a rogue elephant 12 miles to the west. Just as well, for the infection passed with doubled force to the other eye and heavy rain storms were almost incessant.

It was a great disappointment as I had hoped to view this beast's skull on my then closely approaching 79th birthday. Perhaps I may have him during the next few months if he still lives.

Tigers take to killing of human beings for several reasons or causes, one of which is approaching old age and defective teeth. But it is curious that in both these instances the killings were so few and so widely spaced. And why should teeth of only one tiger in the area be so defective? Want of calcium? If that was the cause, it would affect other tigers also. Perhaps it does, but the animals killing cattle showed no sign of bad teeth.

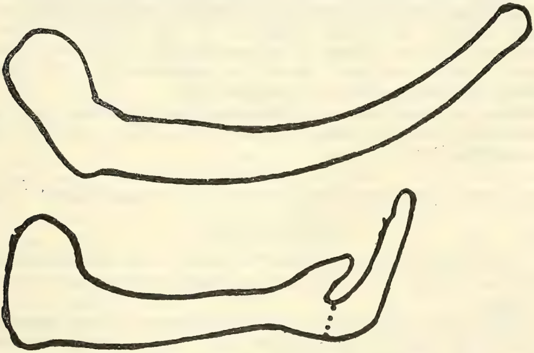
It is a great pity the skull of the Nelliampathies tiger was lost in transit to Bombay at the end of March as expert examination of the skull would have afforded interesting information.

BANGALORE. R. W. BURTON,
December 24, 1947. *Lt.-Col., Indian Army* (Retd.).

2.—ABNORMAL CLAVICLE BONES IN TIGERS

(*With text figures*)

I enclose exact size sketches of a pair of clavicles removed from a 9′-2″ tiger shot by myself here on April 22nd. Note the malformed one, which bears obvious signs of a previous fracture at the point marked with a dotted line.

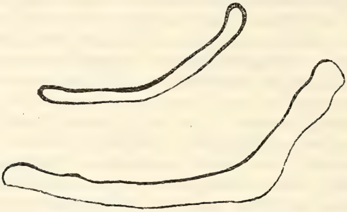


(Actual size)

HONNAMETTI ESTATE,
ATTIKAN P.O.,
VIA MYSORE (S. INDIA).
May 4, 1948.

R. C. MORRIS

[Mr. C. Hinchcliffe of Cachar has also just written us that he shot an old tigress on 25 May 1947 near Kukicherra Tea Estate (Kukichara P.O.) which had *four* clavicle bones—two in each shoulder. The exact size of the clavicles in each shoulder is seen in his sketch. As far as we know this is a unique occurrence. Certainly there has been no instance reported in the *Journal* during the 65 years of its existence.



(Actual size)

In some of the Carnivora such as the Seals (*Pinnipedia*) the clavicles or collar-bones are absent. They are also absent in most of the Bears. Where present they vary considerably in their development; in the Felidae they are slender and curved, being longer than in any other members of the Order. Whatever their shape or size they are always rudimentary and suspended in the muscles. Thus they do not, as in Man, function as a connection between the shoulder-blade and the breast-bone forming an integral part of the skeletal frame. Not being subjected to the normal strains and stresses of physical activity it seems difficult to understand how a fracture could have been caused as suggested by Mr. Morris. Possibly the malformation was congenital?

For a previous note on 'Abnormal clavicle bones of a tiger' (exceptionally massive and curved) and photo, see vol. xxx, p. 910.—Eds.]

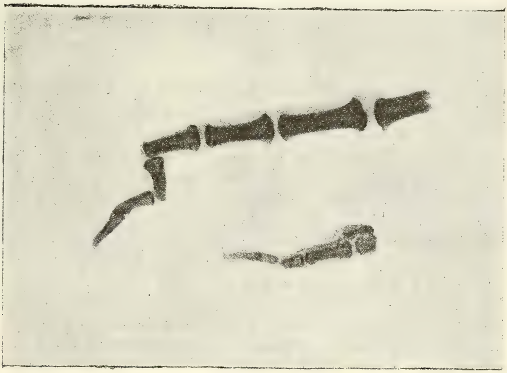
3.—ON THE 'THORN' OR 'CLAW' IN PANTHERS' TAILS

(*With a photo*)

I am posting to you a 'claw' I found at the end of the tail of a large panther (7′ 2″—male) shot by a lady, not far from Khandala, last night.

I send it because I have read of it existing in only, seemingly, the tail of the lion. I have noticed this 'claw'—though in a much smaller and modified form—in several, if not all, of the few panthers I have shot in far apart places in India (hills and plains). In these it was palpable on the outside as the tip of a blunt 'thorn,' and visible as a bare, horny, protuberance, about the size of a pellet of No. 2 shot. At the end of the skinned tail it looked like a short spicule of bone; but, as far as I can remember, had not the curvature of a claw—in fact, I think that in some of the panthers I did not bother to dissect it out with the rest of the tail, owing to the smallness of this bone.

Of the three other persons watching the skinning of this particular panther, two had shot a very large number during the past 25 years and the third had shot many, but none of them had ever noticed any peculiarity in the tip of any panther's tail. Indeed, though the skinned tail had lain exposed under their eyes for a long time, none had observed its conspicuous 'claw' and were surprised to see it when indicated—I had assumed that they had seen it, so only casually commented on its size.



X-ray photograph of "thorns"

You will observe that, excluding the kinked portion, the 'claw' is about ½ inch long; also that the whole has almost a right-angled kink—I don't know whether this is unusual, but to me it is.

Another heavy male panther (not measured, but probably 7 ft. between pegs) was shot a few days ago and I have removed the 'claw'. This, however, has not the double kink of the specimen I previously sent you; and the terminal bone has only a very slight curvature, though about the same length as the other—that is, it is similar in form to those I had found in panthers shot by myself.

If this specimen is likely to be of any interest, for comparison, I shall be glad to post it to you.

Incidentally, I remember that my attention was first drawn, many years ago, to this feature by the slight bottle-brush appearance it gave to the arrangement of the hairs at the tip of the tail. I thus found that a small horny point (I used then to call it a 'thorn') projecting from the tip was responsible for the hairs not growing together there to form a taper, as they do in a dog's tail for instance.

IONA VILLA,
KHANDALA (POONA DIST.).
January 13, 1948.

K. BOSWELL

[There appears to be no reference to a 'thorn' at the end of a panther's tail in the literature available to us. Col. R. W. Burton to whom Capt. Boswell's original specimen was sent commented as follows: 'I have personally shot and skinned about 48 panthers in many parts of India and have often noticed kinks at end of tails which were evidently dislocations, probably occasioned in early life when the bones were soft. The specimen now before me shows similar dislocation—the right angle bend, and the second bend where the 'thorn' commences: two dislocations. I think the 'thorn' consists of 2 vertebrae, the pointed one having for some reason assumed the point we see. If the specimen were to be X-rayed perhaps the 'thorn' would be shown to be in two parts as I conjecture it is'.

Following up Col. Burton's suggestion we had the specimens X-rayed in London through the good offices of Mr. N. B. Kinnear, the Director of the British Museum (Natural History). Dr. Fraser in charge of the Museum's osteological collections who took the X-ray photograph remarks: 'The photograph shows that the similarity to a hook is caused by the dislocation of the terminal vertebral elements. In the larger specimen there is a double dislocation and in the smaller a single one. It is easy to see how with joints suitably dislocated the simulacrum of a hook could be produced'.

It therefore seems established that the curious 'thorn' is the result of dislocations of the terminal vertebrae. There now remains to account for the why and how, since the mutilation seems to be by no means uncommon. It may be the outcome of the playfulness of panther cubs biting each other's tails. But are panther cubs more addicted to this sort of horseplay than tiger cubs? This condition has apparently not been observed in the tiger.—EDS.]

4.—INTERESTING SHIKAR TROPHIES: HUNTING CHEETAH *ACINONYX JUBATUS* (SCHREBER).

(*With a photo*)

The Private Secretary to H.H. the Ruler, Korea State, E.S.A., writes us:—

'. . . All these three cheetahs were shot by the Durbar in our State (Korea—E.S.A.). He was driving at night and they were all seen sitting close to each other. They were all males and the measurements were as follows:—

1. 6 ft. 5 ins. between pegs
2. 6 ft. 4½ ins. ,, ,,
3. 6 ft. 4 ins. ,, ,,

The first bullet killed one and the second the remaining two. The second bullet after having gone through one struck the other, which was behind it, and killed it also. It is not known whether they were born in the State or had migrated from somewhere else.

They were all of the same size, as you would see from the measurements and it is believed that they were all from the same litter. There is no trace of their parents. They were in perfect condition. A photograph of these cheetahs will be sent to you shortly and you can use the photographs as well with the account.

It would be very kind of you to have a record of this shoot published in the Bombay Natural History Journal and the Field.'

MYSORE, S. INDIA. VAN INGEN & VAN INGEN
January 9, 1948. *Artists in Taxidermy*

[The Cheetah is a timid creature and never known to attack man unprovoked. It is harmless to domestic animals; at any rate its numbers within recent years have been far too small for any charge of destructiveness to be justified.

According to Dunbar Brander (Wild Animals in Central India, p. 273—1927) the Cheetah had almost completely disappeared from the Central Provinces. He knew of only three animals having been procured in the 20 years previous to 1927. But rumours of their existence in parts of Berar, the Seoni Plateau and Saugar were still current in his day and he thought it was possible that one or two animals may have persisted. Writing 12 years later, Pocock (F.B.I., Mammals, 2nd. ed., vol. i, p. 328—1939) says, 'It formerly had a wide distribution in Western and Central India south of the

Ganges and extended through the Deccan at least as far south as Coimbatore (R. C. Morris) its range agreeing tolerably closely with that of the Blackbuck. But it is now to all intents and purposes a thing of the past so far as the fauna of India is concerned. . . '

The editors were so nauseated by the account of this slaughter that their first impulse was to consign it to the waste-paper basket. Its publication here is intended in the nature of an impeachment rather than any desire on their part to condone or extol the deed. That anybody with the slightest claim to sportsmanship —and the general run of Indian princes justly prided themselves on that—should be so grossly ignorant of the present status of the Cheetah in India, or knowingly so wanton as to destroy such a rare and harmless animal when he has the phenomenal good fortune to run into not one but three together—probably the very last remnants of a dying race—is too depressing to contemplate. Further comment is needless.

What adds to the heinousness of the episode is that the slaughter was done while motoring through the forest at night, presumably with the aid of powerful headlights or a spotlight. This, it will be recognised, is not only against all ethics of sport but it is a statutory offence deserving of drastic action by those whose business it should be to enforce the law.—EDS.]

5.—REACTIONS OF DOGS TO NOISES

Mr. Roonwal's note on the behaviour of a dog to the sounding of a siren gives a quite common reaction by dogs to certain sounds. I have known dogs howl in the same manner as described on the gramophone being played.

There are here in this hotel a couple of dachshunds, who, every day without fail, when the nearby R. C. Church rings the Angelus at mid-day, sit up and howl together until the bell stops. The bell rings early each morning and in the evenings but the dogs do not take any notice at these times. A number of sirens sound early mornings and also at mid-day but to these the dogs do not react.

I think that it is a well established fact that some dogs will react to music, singing and other sounds in this manner, why a few do so and others do not is perhaps a matter of temperament. It is, however, lucky that all dogs do not, as the noise in any Indian town would be unbearable! They are bad enough as it is at nights when the jackals start up.

HILL GROVE HOTEL,
COONOOR, NILGIRIS (S.I.). R. N. CHAMPION-JONES
April 30, 1938.

6.—JACKALS

I wonder how many of our members will look at the title with a commisserating smile and decline to read further? Jackals, indeed, what can anyone have to say about such dirty, skulking scavengers that is not already well known to every resident of India, or worth recording. Well, let us see? I have been asked to write a popular article on shikar, or nature study and I choose the latter, *and* a subject which I have found of enthralling interest, but the Editor is quite at liberty to tear it into shreds for his w.p.b., should he think the poor *harijan* of the wilds not fit to write about, or everything I say of him already well known.

I have kept four at different times which roamed the hills with me and my dogs, came into the house when they felt inclined, knew tea time as well as the dogs did and waited with them in the drawing-room when it was laid for master and missus to come and minister to their wants. To all intents and purposes they were just 'dogs' as far as *we* were concerned. I shall not attempt to write of the ways and vagaries of each individual, as I should need the whole *Journal* for that purpose, but Jackie, Julia, Jane, Jimmy and Josey will all be lumped into one canine whole, except where it becomes necessary to separate the vagaries of the male from the female for any particular reason.

Our first one, Jackie, was a mistake, as he was not wanted but circumstances ordained otherwise, and he came into our keeping when 6 days old and with crinkly eyes tight shut. When out for a walk in the jungle my Labrador bitch, Dual Ch. Rosalind of Dagon, to give her her full name and title, commonly known as Rosie, appeared to be definitely inviting me to follow her. Twice I ignored her invitation but she was not to be put off so easily, so eventually I followed. She led me to a big rock, stood under it and almost spoke the words—'Come, look what I have found?' I went up to find a tiny mass of jackal—four wee cubs cuddling together at the mouth of a cave, where the mother had brought them to get the last of the setting sun. Almost without thinking, I picked up the top one to show to my wife, put it in my pocket and we continued our walk, and the result was that Jackie came to stay. What a worry he proved and the most difficult thing to feed I have ever struck, and I have had experience with tiny babies of all kinds, such as wolf, hyaena, bears, panther, foxes all of which were simple to feed, but Jackie was the very devil. Anyway, like Topsy he 'growed up' through a stage of ricketts which cod-liver oil and Virol cured. He slept in a fruit basket filled with straw, in our bed-room, and was about a month old when he first declared himself and his instincts. I had shot a panther the night before and had put him in the verandah of an adjoining cottage. When the dogs were let out in the morning they discovered the panther and started barking. Now panthers were no novelty in our garden and our dogs frequently announced their last night's scent by a succession of barks, in which we could notice no difference, but to our amazement a succession of sharp *pheows* from the basket informed us that little Jackie knew what the dogs were barking at. Could it have been scent or was there some slight difference in the bark of the dogs which his sensitive ears had picked up?

Quite early in his career I discovered that Jackie (they will all be Jackies, hereafter) was very partial to beetles, craneflies and their grubs, grasshoppers and the larvae of beetles, so we used to saunter out 'beetling' and it took the little chap only an hour or two to discover that if I bent down and smote the ground with my open palm, or with a fly-flap, it meant a titbit for him and he would come rushing over to me to discover what I had got. If I had missed, he almost told me what he thought of me! Time went on and the monsoons broke and brought in their train a horde of beetles to devour my roses. In the evenings Jackie sat in the middle of the lawn and I very soon discovered that the coordination between eye and ear were marvellously developed in a jackal. If I heard the drone of a beetle it merely conveyed to me the general direction it came from, but possibly several yards wide of the actual spot. Not so with Jackie. He looked, and probably had been, half asleep on the lawn, but the drone not only woke him but he was up and off, straight at the rose bush whereon was circling the beetle. Next instant there was a jump and Jackie was munching through the elytra of the beetle! Not once nor a dozen times, but hundreds of times I saw him jump up from a quiet snooze into life and without the smallest hesitation to let his eyes confirm what his ears had heard, he would be under the exact bush where flew the beetle. Later on in the evening when the destroyers of our roses came in by the hundred, the jackal was in his element for long after he had eaten all he wanted he just amused himself crunching them up.

Just about this time toads began to make their appearance and I noticed that Jackie had a very special way with them. He would get behind the most repulsive looking one he could find and with a forepaw stroke its back, very gently. After about the third stroke the toad would deflate slightly and say *kon kon kon* in a by no means unmusical tone. Jackie would turn his head to one side, listen very intently, and repeat the performance several times. On one occasion I had put him into his pen for some reason or other and Jackie, to my surprise, seemed most indignant at being thus treated, though normally he quite liked his pen and was quite content to be in it. He climbed 5 ft. up the wire netting, he bit at it and seemed determined to get out, so I let him go and he dashed off as hard as he could go to the other end of the lawn and disappeared behind a deodar. Wondering what important business had taken him there I followed and discovered he had got a particularly repulsive toad with dirty green protruberances and carbuncles all over his back, and soon found he was most tuneful and Jackie was going into ecstasies over him. In a few minutes either Jackie got tired of the amusement or the toad got tired of amusing him, but he just trotted away and left the toad to its nightly wanderings.

Towards the end of the rains we had some frightfully heavy showers and Jackie gave me an instance of his many uses as a friend of man. After it had been pouring for an hour or two Jackie would go and sit down in the middle of the lawn for a few minutes, then get up and use his nose to scrape up fids of earth much as a pig does, and I noticed each time he did so he ate something. I got an umbrella and went off to see what he was eating and to my joy discovered he was devouring leather-jackets by the dozen, nay, by the hundred. Heavy rain seemed to bring them to the surface, or near it, and as soon as Jackie's nose told him they had come up he pushed his nose below them, turned over the turf and got his titbit.

As this happened every day towards the end of the monsoons, I was more than delighted to find that the bare patches which had been getting larger on my lawn, suddenly began to disappear thanks to Jackie's ministrations.

Crane-flies and their grubs, and beetles and their grubs disappearing at the rate of umpteen a day made a distinct difference to the garden and saved the *mali* much time and labour.

All the above were most useful but quite comprehensible, and whether instinct was at the bottom of it or intelligent watching and the connection of cause and effect, does not materially matter, but the next incident in Jackie's life defeated me entirely. As I have said panthers are no novelty in Dharmsala and whether in my garden or along one of our many walks, it was a common thing for the dogs and Jack to get the scent of one along the road, and show their respect in the furtive glances they threw this way and that with tails at half mast. On this occasion I was coming down a mountain path with all the dogs and the jackal nosing about ahead, none showing any sign of the presence of a feline, till I came into a tiny clearing where Jackie showed extreme alarm and kept on looking down the hill. A very strong breeze blew down from above, so very obviously if danger threatened it must come from above, but Jackie climbed cautiously on to every rock and every prominence to gaze *down* the hill, so sure was he that danger lurked below. The dogs went on quite happily unaffected by breezes or Jackie's manoeuvres, and I was quite at a loss to know what to think. Knowing Jackie's nose of old I was prepared to trust him more than my dogs, but his tactics *against* the wind left me guessing. Some 50 yards ahead, and below us, was a water channel and alongside it ran a small and little used path. I followed Jackie on to a flat rock and looked over and on the path beside the water channel crouched a large panther.

One of my dogs was approaching the channel and a loud 'heel' brought her back and sent the panther off into the adjoining jungle. Now what was that sixth sense that warned Jackie of the danger which conveyed nothing to the dogs? Had the feline been above us at any time, or on the clearing the dogs would have got his scent at once, and how did Jackie get it, or whatever he did get, with the wind directly against him?

The jacks got their food at the same time as the dogs, i.e. just as we returned from our evening walk, but in different parts of the house and we soon made another discovery.

If their noses, or that sixth sense told the jacks there was danger and his Spotted Highness was about, nothing would induce them to come inside and have their dinner till the danger was past. Our house was the highest in the station and bordered a jungle so was always the first to be visited by the panthers who were on the prowl for dogs, and on their way to the Gurkha Lines and Cantonments generally. The jacks would sit on the lawn with their backs to the house and their heads going from side to side the whole time. Shortly after dusk we would hear the well-known *pheow*, either in spasmodic jerks and barks (showing the feline was very near) or in measured tones. A few minutes later the jack would come in and announce that the feline had gone down and the coast was clear.

While we were learning jungle lore from the jacks I tried my hand teaching Jackie tricks, and found him almost as easy to teach as my Labradors.

He sat on command; would not touch food till told to eat it; retrieved balls on land and from water, though I cannot say he could be depended on to do so every time, but three times out of five he would deliver to hand, provided no stranger showed himself. On one occasion Jackie arrived on the lawn with a full-grown Leghorn cockrel in his mouth. I yelled to him to 'drop it', when he was some 20 yards away, and he did, and to my amazement the cockrel did record time up the hill and had all my compound out to catch him. I cursed our sweeper for letting our fowls go and he assured me it was not one of ours! Two days later I discovered Jackie had brought it up from a village almost $\frac{3}{4}$ miles away, and yet that bird had not got a tooth mark when we examined it, and was none the worse for its adventure.

I wondered how many Labradors could carry some 4 lbs. of cockrel up a very steep hill for $\frac{3}{4}$ of a mile without so much as pinching it?

Here was material for a high class gundog. A magnificent nose, an excellent mouth and plenty of intelligence to learn the requisites of a good gundog. But, and a very big but, an essential that was the hardest to inculcate, viz:—his natural fear of, and aversion to, man in a strange form. How was this to be taught. It is not possible in one generation but if two or three litters could be born in captivity and the mother induced very very gradually to bring the cubs out of her box to master or missus for food, the battle would be won, but not otherwise.

Cub-drill in jackaldom is a high class art and learnt in a hard school where mistakes are not tolerated. I have spent hours and hours sitting over their dens watching and listening, when the cubs are three to five weeks old and normally follow mummy out to the mouth of the cave after their meal. Rosie, the Labrador already mentioned, was a motherly old soul and trusted by both Julia and Josey when they had cubs. If she was at the mouth of the cave with me, the mother would come out with the cubs following and scramble about Rosie's legs and even allow me to touch them, but if another dog showed up, or I made a false move, all you would hear was a soft *chook chook* through closed lips and the cubs were gone in a second, and nothing would bring them out again until mummy or daddy called them.

Mummy does not believe in molly-coddling methods. Her type of play with her cubs would send a human mother shrieking into a lunatic asylum.

She goes off a few yards from the cave and squeaks at them to come out and they obey with alacrity, but as each reaches the old lady, she gets it by the scruff of the neck and literally throws it down the khud and the poor wee thing having rolled two or three yards after its fall starts very slowly climbing up again, only to meet a brother or sister coming down headlong to meet the first, till all have had a bit of this horse-play.

The natural intelligence, not necessarily the cunning engendered by centuries of life preservation, but the intelligence which denotes a high grade of thinking, is greater in a jackal than in a dog. Here are but a couple of instances :—You give a dog its food on the ground in a dish and long before he has finished his dinner the dish is waltzing round the room with the dog in hot pursuit. Not so a jackal. He might do it once or twice, and after that he will put his foot into the middle of it and eat round it. I have kept dogs of all kinds for 50 years and more and never once have I seen a dog so much as look up at a picture in a room. Jackie often came in for chota-hazri and took up a commanding position on my wife's bed. One morning I noticed him look up at the wall and turn his head round from one picture to another. I called my wife's attention to him and there could be no possible doubt about it, he was deliberately looking at all the pictures in the room. Why or wherefore I do not pretend to know, but can merely state the fact.

Now as this account of my jackals is getting too long I will bring it to an end with a couple of observations which hardly seem worth mentioning, but it is simply amazing how many people one meets who say—'fancy keeping a jackal as a pet, are you not afraid of rabies?' It is no use trying to convince them that jackals are just about as sane as they are, normally, and can only give you rabies when they are bitten by a mad dog or other mad animal, and develop it themselves. 'They are carriers, the germ lies latent in them and may come to life any moment' say the wiseacres and so on *ad lib.*

Enquiries made some years ago from Kasauli brought back the assurance that out of all cases reported at the various institutes in India some 89% were dog bites and the remaining 11 caused by mongooses, jackals, foxes, wolves etc. etc. which goes to prove that the poor old jack is not nearly as bad as he is made out to be!

I wonder how many people who have known jackals for many years could be induced to believe that there is a spark of pluck in their anatomy?

Yet, I venture to assure my readers that they would be surprised to see what a jack is capable of. A dog has no terrors for a jack who has been brought up among them and will take on one twice his size and often beat it.

Of course, normally, he will run from the first dog that chases him. That instinct has been inherited through aeons of time, just as his natural fear of man, and however much he may live with people, be a pet among them and quite happy with those he knows, a stranger will send him sneaking off as fast as he can go. Here is a story which can be vouched for by a whole company of Gurkhas who were parading at the time not far off. I was exercising my dogs with balls, and Jackie was sitting under a tree quite near, when a great big sheep dog made a dash at one of my bitches as she picked up the ball. Before that sheep dog knew what was happening he had a little fiend with needle like teeth fix itself on to his side. He jumped about two feet into the air but as he landed again the jackal had him on the other side, and the last we saw of him was a shrieking dog dashing up the hill at full speed and a jackal, one-third his size, in full pursuit to the accompaniment of a full-throated roar from the Gurkhas who were much amused.

The period of gestation of a jackal is much the same as that of a dog, viz:—60 to 63 days and unlike the dog they are monogamous and wonderfully faithful to each other. The mating season is February and the cubs are born in April, usually five to the litter. The father keeps guard over the den much more than does the mother and both parents regurgitate food for the benefit of the cubs from the time they are about three weeks old besides the mother's milk which she supplies till the cubs are about 6 weeks old.

The jackal being a true canidae mixes freely with the dog and the pups of the union are also fertile.

There is just one incident which is, I think, worth recording of a wild jackal coming into captivity of its own accord. Jane had been destroyed by mistake and Jimmy was left disconsolate. One evening, during our usual walk, I noticed a wild jackal following some 50 yards behind. As soon as I looked back it bolted down the khud but two hundred yards further on I saw it again. Next morning the same thing happened. My dogs also spotted it and I had to stop them giving chase. That jackal got nearer and nearer and within 10 days was walking behind me with four or five yards. A month later she was coming into my office and even into the drawing-room. Finally she had cubs by Jimmy in my compound and all went well till I did a very silly thing. She did not mind my standing 10 yards away while she brought out the cubs, but on this occasion, though 30 to 40 yards away I hid behind a bush without thinking. That was too much for her and I had become an object of suspicion. She dashed forward, picked up a cub and rushed down the hill with it followed by Jimmy with another and by morning all the cubs had gone.

C. H. DONALD

7.—MORE ABOUT JACKALS

In the article I sent for the *Journal* about jackals, there is one point I forgot to make in respect of the jackal's intelligence, and since sending it, I have been asked two fresh questions which I will now endeavour to answer:—

A. As regards intelligence. A dog, should he think of stealing from a table laden with good things, will generally put his paws up, stand on his hind legs and choose what he wants and risk master coming in and catching him at it. My jackal, the only two occasions on which he so far forgot himself, or perhaps never thought about it at all, as I was sitting next to the table at the time, selected a low round table on which reposed the cakes and other good things, just caught the end of the tea-cloth and backed away from it. Of course, everything was on the floor, but luckily the carpet was a very heavy one, with thick pile and no damage was done. This happened once again a month or two later, and Jackie was flung from the room with ignominy and got no tea at all, so never repeated the experiment again, and could be trusted to sit with the dogs, in the drawing room, with the tea things laid and not a human in the room, without attempting to steal.

B. Are the dog and jackal closer to each other than, say, the horse and the ass? Why, otherwise are their offspring fertile when mules are sterile?

C. i. Do the sexes in the jackal also get 'hitched up' post-copulation as the dog does? What is the significance and purpose of this 'hitching up'? and how can it be of use to a wild animal that has always to keep on the alert?

ii. Have you any information as to whether this happens also in other members of the Canidae? Is it known, for example, in wild dog and wolf?

B. I would definitely say the jackal and dog are much closer to each other than the horse and ass. I have always understood that the jackal and wolf are the progenitors of the domestic dog. In the aeons of time through which they have existed, the jackal and wolf have remained true to type, whereas the dog, in his association with man, throughout the centuries, has been experimented with, hybridized, subjected to selective breeding, till it is impossible to say what the original was like, but whatever it was like it *was* a dog, and the millions of generations handed down are still dogs, whether they are Sydney Silkies or Great Danes and they could produce fertile pups provided the great difference in size did not destroy the smaller, in the act.

A few years ago two cubs or pups—whatever they were—of jackal—Alsatian cross were presented to the Lahore Zoo. I begged the Curator to try and breed from them. The two, I may say, were about half way in size between an Alsatian and a jackal, ginger in colour with a black, broad stripe down the back, jackal eyes and head, but the latter a trifle bigger than a jackal's. Both exhibited the jackal's innate fear of man.

In course of time their 'cub-pups' arrived, four of them. Two were very like the parents and one with brownish markings and erect tail; the fourth was almost entirely black, with long smooth hair and curly tail.

All sold well and made a profit for the Zoo.

In the following year five youngsters arrived. Two still upheld the characteristics of the parents—sort of ginger jackals. Two were nondescripts—neither bad jackal nor good dog and need no particular mention. The fifth was a law unto himself and jet black above from snout to tip of tail, and pure white beneath from tip of chin to end of tail, including the inside of the legs. At about 2 months old, when I last saw him, he had a very 'gay carriage' to his tail, which meant that it would be a complete circle later on. The only part of him which showed his jackal origin was the very definite jackal eye, already turning from baby blue to yellow, encircling a small black pupil.

My conclusion (right or wrong, I leave you to say), was that the Alsatian mother was not too good a specimen and was throwing back to past sins in her progeny. One cannot conceive a perfectly good jackal producing conundrums of this nature!

In his habits post-copulation, the jackal is exactly the same as a dog, remaining 'hitched-up' for about the same period. One difference between the dog and jackal is the period of heat, which normally comes twice a year in the dog, but only once in the jackal, about the middle of February. Three of my jackals had cubs, in different years, on 10th April in each case.

I cannot pretend to know what the significance of this 'hitching-up' procedure is, but it must be extremely disadvantageous to a wild animal, where leopards and other marauding felines are about.

As regards C ii. I have no knowledge, but would suggest the Superintendent of the Victoria Gardens being asked, as he successfully mated his Alsatian to a wolf in the Gardens, and had five pup-cubs as a result.

I should, however, hazard a guess that there is no difference between the dog, the wolf and the jackal in this respect, though it might easily not apply to the wild dog or *dhol.*

January 8, 1948. C. H. DONALD.

[Col. R. W. Burton comments on the above note as follows:

'Without doubt the domestic dog and the jackal are closely related, much closer than the horse and the ass; and the wild dog of India must also be not far away from the jackal and the domestic dog for there are reported observed instances of hybrid wild dog and jackal, and of domestic dog and jackal.

In regard to post-copulation 'knotting' Mr. Charles Theobald, F.Z.S. writes that when his wild dog pair mated (see article on Wild Dog in Vol. xli, p. 698) they became 'knotted' in the same manner as the domestic species and in regard to actual breeding were exactly the same as domestic animals—no difference whatever.

Instances of the English Fox interbreeding with the domestic dog have been recorded in the 'Field' newspaper. The offspring of these unions were fertile with domestic dogs. It has also been reported in the 'Field' that 'knotting' takes place in both pure fox and fox unions, and in fox and domestic bitch unions. References: 'Field' of 10th January 1942, page 44; 7th February 1942, page 149; 7th March 1942, page 261.

In reference to 7th February 1942 above, it is stated that 'knotting' is not essential for whelp production in all canine unions, and that experienced dog-breeders are aware that 'non-knotted' unions are often productive when both parents are dogs.

It is however probable that in case of practically all wild dog unions and fox unions, and jackal unions 'knotting' takes place, so Nature has not found that 'knotting' is a disadvantage or it would not occur.

It is common knowledge that when a number of male dogs pursue a domestic bitch (such assemblies are often seen in India) the successful suitor is not molested by others of the pack while the mated pair are in a 'knotted' state. That is likely also to be the case with wild dog, and fox, and jackal unions in a wild state'.—EDS.]

8.—SAMBAR GNAWING BARK OF *WENDLANDIA NOTONIANA*

I have always noticed that sambar were partial to the bark of the *Wendlandia notoniana*; but not to the extent as they appear to be on the Biligirirangans this year. It may possibly have been due to the scarcity of grazing, as it has been a very dry season, with all grass burnt by forest fires; but a very large number of trees of this species have been debarked from ground level up to a height of 6 or 7 feet, and even more, with the bark even removed off the lower branches. I wonder if the bark is known to possess any medicinal properties?

HONNAMETTI ESTATE,
ATTIKAN P.O., RANDOLPH C. MORRIS,
VIA MYSORE (S.I.). *Colonel.*
June 3, 1948.

[In reply to our query Mr. M. B. Raizada, Asst. Forest Botanist, Dehra Dun, writes that as far as he is aware the bark of *Wendlandia notoniana* is not known to possess any medicinal properties. This view is confirmed by officials of the Minor Forest Products section of the Forest Research Institute, Dehra Dun.—EDS.]

9.—SAMBAR NECK SORE

I shot a 36″ stag today (late for a stag to be in hard horn). Besides having a most pronounced sore the stag's neck was bare except for a ridge of hair on the nape. There was ample evidence that irritation had spread to the sides of the neck causing continual rubbing.

(2) I believe that there is a definite relation between the new-grass feeding and the shedding of sambar horns. I have noticed that when the March-April-May thunder storms ('Mango showers') are late, sambar remain in hard horn later.

HONNAMETTI ESTATE,
ATTIKAN P.O., R. C. MORRIS,
VIA MYSORE (S.I.). *Colonel.*
May 23, 1948.

10.—WILD DEER IN MAURITIUS

In the *Journal* of our Society, Vol. vll, pp. 440 to 446, is an account contributed by Rear Admiral W. R. Kennedy of a visit in the year 1892 to the islands of Rodriguez, Mauritius and Reunion. With it is a lithographed drawing of the head of a Rodriguez stag, shot by the Admiral, having horns of 34 in. in length with upper tines and brow antlers of 14 in. The gralloched weight was 229 lbs.

At that time the herds of deer roamed in the old forests of Rodriguez unmolested except by naval officers during their rare visits to the island. The deer were introduced, the Admiral related, some thirty years previously when a pair were landed from Borneo and subsequently another pair from Mauritius. 'These have done well, and at the present day(1892) possibly from 1,500 to 2,000 deer exist on the island, some of the stags being as much as 20 stone in weight and carrying fine heads.' That was a good stock of deer for an area only ten miles long by four broad. The climate is similar to that of Mauritius, and the highest peak on the island is 1,300 feet.

Regarding Mauritius the Admiral remarked, 'During our stay several of the wealthy proprietors organized *châsses* in our honour, on which occasions many deer were killed . . .'

With reference to the above it is pleasing to read in the comprehensive present day account contributed to the 'Field' of 31st May 1941 by P.H.G., 'It is estimated that there are at present some 20,000 to 25,000 head of deer on the island (Mauritius). *La Châsse* accounts normally for about 2,000 every season. . . . A full grown stag weighs about 20 stone, . . . The head is remarkable for the beautiful grain of horn and the long, sharp tines of ivory whiteness.'

'These deer', writes P.H.G., 'are *Cervus rusa* the species being said to have been originally introduced by the Dutch, who were the original colonists, from Java in 1639.' Admiral Kennedy believed the Mauritius deer to be identical with the Sambar, having been introduced from Ceylon. 'It will be noticed', says P.H.G., 'by readers of Mr. Rowland Ward's standard work "Records of Big Game", that the parent stock of *Cervus rusa* in Java exhibit greater length, while their acclimatized descendants in Mauritius excel in span.' A notable head exhibited at the present time in the Port-Louis Museum has outside curve of 34½″ with remarkable tip to tip span of 33″ which is possibly a world record for this variety of deer. A photograph of this head is given.

P.H.G. gives the dimensions of good present day heads as averaging 28 to 35 inches outside curve with tip to tip span of 18 to 26 inches, so it is evident the stock has not deteriorated in horn growth or in number of the animals on the island of Mauritius.

In his monograph 'The Larger Deer of British India', part iii, published in Society's *Journal,* Vol. xliv, pp. 27 et seq., R. I. Pocock gives the type of the Genus *Rusa* H. Smith to be *Cervus unicolor* the distribution of which is from Ceylon and India eastwards to the Philippines and beyond, and admits three species of Sambar.

1. *Rusa unicolor unicolor* Kerr.

   Locality of the type Ceylon, as restricted by Hamilton Smith. Distribution:—Ceylon.

2. *Rusa unicolor nigra* Blainville.

   Locality of the type not stated but probably somewhere in north India. Distribution:—India apart from the western desert and semi-desert areas, but not perhaps crossing the Brahmaputra in the north-east, the Assamese Sambar belonging apparently to the next race.

   Distinguished from the Ceylonese race by its potentially larger antlers and apparently larger skull.

3. *Rusa unicolor equina* Cuvier.

   Locality of the type Sumatra. Distribution:—from Sumatra, through Malaya to Burma and Assam, Siam, Cambodia, Cochin, China, Annam, Yunnan, Szechwan, Hainan.

   Distinguished from the Ceylonese and Indian races by the terminal tines of the antlers being much less variable in their respective lengths, the front-outer always definitely continuing the line of the beam and being longer and thicker than the back-inner which projects inwards, backwards and upwards from its inner side; the antlers also are much shorter on the average than in the Indian race, with the brow tine longer compared with the beam, and there is some evidence that the skulls are a little shorter on the average.

It is certain therefore that the Sambar of Mauritius are descended from either 1 or 3 of the sub-species described by Pocock; and from which of the two could only be decided by expert examination of a series of skulls and horns.

BANGALORE. R. W. BURTON,
December 20, 1947. *Lt.-Col., Indian Army (Retd.).*

[Mr. W. W. A. Phillips, author of 'Manual of the Mammals of Ceylon' comments on the above as follows:

'Colonel Burton's note, on the occurrence of Wild Deer in Mauritius is of considerable historical and general interest. To learn that the descendants of the Sambar, liberated on Mauritius, are still so plentiful, is most pleasing in these days of the rapid decrease and extermination of wild life, all over the world and especially in the East.

Until a series of specimens of the Mauritius Deer has been submitted to the British Natural History Museum authorities, for critical examination, an element of doubt must remain as to which race of the Sambar they are referrable. Personally I am inclined to the belief that they will be found to belong to the typical race *unicolor* from Celyon. The description of the three-tined antlers of the Mauritius Stag, approximates closely to that of the typical head of the Ceylonese race, with the exception that the average stag in Mauritius would seem to have developed a slightly longer main beam. The record antlers of the Ceylon Sambar stag (*Rusa unicolor unicolor*) measure 33⅞ inches with a spread of 21¾ inches and any head measuring over 30 inches is considered an exceptionally good one for the typical race. Colonel Burton states that 'P.H.G.' gives the dimensions of good present-day heads in Mauritius, as averaging 28 to 35 inches, outside curve, with a tip to tip span of 18 to 26 inches.

The possibility that the Dutch liberated sambar from both Java (or Borneo) and Ceylon, cannot be overlooked—the present day Mauritius Sambar may be of mixed descent. This is quite likely as during, the Dutch occupation, ships from both Ceylon and Dutch East India must have been continually calling at Mauritius and, as the young sambar is easily tamed and does well in captivity, there would be little more difficulty in bringing sambar to the Island, than domestic animals.

The Dutch appear to have been much interested in the experimental introduction of certain wild animals into their possessions. Not only have we this instance of the introduction of sambar into Mauritius and the neighbouring islands, but they are believed to have been responsible for the introduction of the Hog-deer (*Hyelaphus porcinus*) into Ceylon, during their occupation. The Ceylonese race of the Hog-deer has now been separated by Pocock, under the subspecific name *orysus* (see 'The Larger Deer of British India', part iv, *Journal, Bombay Natural History Society,* Vol. xliv, p. 177). Unfortunately, unlike the Mauritius sambar, the Ceylon Hog-deer is a fast dying race, having been brought to the verge of extinction through night shooting, in season and out.

Rear-Admiral W. R. Kennedy, who contributed the original account of the sambar in Mauritius, was evidently, like so many naval officers, a keen sportsman. It was he who was one of the prime movers in the formation of the Ceylon Game Protection Society, which still continues as the Ceylon Game and Fauna Protection Society. Rear-Admiral Kennedy, who was then commanding the East India Squadron, took the chair at the inauguration meeting, held in Colombo on the 28th May, 1894.'—EDS.]

11.—STRANDING OF A WHALE (*MEGAPTERA NODOSA*) ON THE TRAVANCORE COAST IN 1943.

I was surprised to find that there is no reference to the stranding of a specimen of *Megaptera* on the Anjengo Coast near Quilon in Travancore, in the list prepared by Mr. S. T. Moses and published in your *Journal* of Dec. 1947, p. 377. I had prepared a note on this then, but somehow it was not sent up for record. [Therefore no reason for surprise.—EDS.]

The whale was reported to have accidentally got entangled in a seine net. To save the net from destruction, the fishermen tried to scare away the creature, when it broke away and made a bid for liberty, which took it, however, towards the shore, where it was stranded. This accident occurred on January 23, 1943. On the following day, I visited the place and saw the whale with the greater portion of the body under water. It was alive and was gradually getting exhausted. It measured 49 feet 4 inches in length. Girth around the shoulders 38 feet 10 inches. Each flipper was 17 feet long.

The blubber of this specimen, was taken by the Marine Biology Department of the State. I am informed that the maximum thickness of it was only 4 inches and about 350 gallons of oil were extracted. The skull and parts of the skeleton are preserved in the laboratory of the Marine Biology and Fisheries Department, Trivandrum.

It is interesting that this species has not so far been recorded stranded on the Indian coasts—the only record being one off Baluchistan coast in July 1873.

TRIVANDRUM. A. P. MATHEW,
May 15, 1948. *Dept. of Zoology, University College.*

12.—ON THE OCCURRENCE OF *SITTA FRONTALIS* SWAINS. & *SITTA CASTANEA* LESS. IN KHULNA SUNDERBANS.

Sitta frontalis Swains. was one among the few species collected by me during my short and hurried trip in August, 1944 to the Sunderbans (Khulna). Thanks to the courtesy of the then D.F.O., who kindly accommodated me in his launch 'Harrier', I had the opportunity of a halt for three consecutive days (Aug. 4 to Aug. 6) at Nilkamal, almost at the sea face. I observed *Sitta frontalis* Swains. occurring there as a common and abundant species and affecting forests not only along the sea face, but sometimes a little distance away. It is interesting to record how while taking recourse to a jolly boat I approached the sea and there got down to an island, whose surface level is generally above that of high tide, I encountered parties of *Sitta frontalis* Swains., affecting many a tall tree, mostly bare and devoid of branches, as well as fallen logs or overturned stumps lying on the sandy ground. They were common enough and were often noticed together with *Dryobates macei* (Vieill.), *Parus major cinereus* (Vieill.), and *Pericrocotus peregrinus* (Linn.). The surface level of the islands at a little distance from the sea face, however, is more often than not low and constantly being subjected to tidal waves. Access to them is only possible by means of a small boat along narrow channels and cross-channels, intersecting the stream or *khal* where our launch was lying at anchorage. I ventured into one such island on the morning of 6th August, but the slimy and slippery nature of the soil, invariably wet and water-logged, studded all over with spiky roots, or rather aerial root-suckers, jutting out from the subterranean roots of the forest trees, made it impossible for me to make any headway to get a closer view of the nuthatches abounding there. The trees along the comparatively higher bank of the *khal*—notably Keora (*Sonneratia apetala* Ham.) which is characteristic of Sunderban river banks—were noticed to harbour quite a large flock of these birds, and from the boat I did actually shoot some specimens, but the tides stood in the way of my retrieving any except one. Its measurements are: wing 70, tail 43, tarsus 17, culmen 13 mm.

It is worthy of note that nowhere in this area was *Sitta castanea* Less. noticed, though it is quite a common and numerous species, which I often encountered, in the evergreen forests considerably inland. Regard being had to its known period of breeding, its occurrence in these parts of the Sunderbans in the beginning of August might indicate its status as a resident species. While its favourite haunts appear to be the inland tree forests the distribution of *S. frontalis* Swains. is evidently related to the forests at the sea face or those in the neighbourhood. Wherever during this trip the species came under my ken, it appeared to have a preference for keora trees, whether of stunted size as are general along the sea face, or of medium height as are found a little away from it. In its haunts in inland swamp forests *S. castanea* Less. seems to be partial to mature keora trees.

50 Kailas Bose Street,
Calcutta. S. C. LAW, M.A., Ph.D., F.N.I.
April 21, 1948.

13.—ON THE OCCURRENCE OF THE BLACK-HEADED CUCKOO-SHRIKE (*LALAGE SYKESII*) AT AHMEDABAD, ABU ROAD AND AJMER.

According to Hugh Whistler the north-western limit of the Black-headed Cuckoo-Shrike is a line drawn from Kangra through Sambhar to Mt. Abu. This being the case any record of observations of the bird at places situated along this line, however incomplete, may be of some value.

The Black-headed Cuckoo-Shrike is not, in my experience, a bird whose movements can easily be studied and worked out. It is shy of close observation and is most readily detected by its loud and distinctive call note uttered as it moves about inside the foliage of large leafy trees. In these circumstances it might easily be overlooked during the silent phase. I have always presumed it to be absent when its call-note is not to be heard and have certainly never seen it at any other time except the vocal season.

I saw the bird first at Abu Road during the monsoon of 1928 and wrote a description of it to the B.N.H.S. for identification on 17th August 1928. A single pair inhabited the railway officers' cantonment throughout that monsoon and were seen about until some time in September, but were not seen thereafter until the time of my transfer to Ajmer in March 1929. The bird was *not* seen in Ajmer throughout the summer and monsoon of 1929, although I was watching for it.

In 1931 I was stationed in Ahmedabad and on a visit to Abu Road saw a bird there on 6th July. On 10th and 12th July respectively a hen and a cock bird were seen in my compound at Shahibag, Ahmedabad.

On 19th July Mr. Symes, Executive Engineer, Abu Road, wrote that he had seen a pair of birds moving about in the compound next to his own and that they seemed to be taking an interest in a particular nim tree. He did not, however, find any nest that year.

In the spring of 1932 I was myself transferred to Abu Road and heard a Black-headed Cuckoo-Shrike calling on 13th May and again on 16th May. Thereafter it was seen and heard frequently until 22nd September, but no nest was found.

In April 1933 I was again posted to Ajmer, but the bird was *not* seen *nor* heard there throughout the summer and monsoon.

I was stationed in Ahmedabad from November 1934 until March 1938, but did little bird watching for the first two years and have no records at all for 1936. On 3rd July 1935 I heard a Black-headed Cuckoo-Shrike calling in my compound in Shahibag and saw the cock bird on the 4th July.

On 21st May 1937 I heard and saw a cock bird in my compound. Mr. Symes writing to me from Abu Road reported hearing one on the same date but not since (letter dated 25th May). I continued to hear the bird in my compound until 28th May, but thereafter did not hear it again until 13th June.

On 20th June Mr. Symes wrote to me again that he had found a nest in his compound at Abu Road and that the bird was sitting. On 8th July he found the nest deserted and the birds building again.

During the monsoon of that year I heard and saw Black-headed Cuckoo-Shrikes frequently in and around Ahmedabad. My last record of seeing a bird that year was in Ahmedabad on 23rd August 1937.

In 1939, on a visit to Ajmer, I was surprised to hear the well known call of a Black-headed Cuckoo-Shrike on 24th June, but did not actually see the bird. However, on a subsequent visit on 8th August I saw a cock bird. This was a famine year and the total rainfall in Ajmer was only about 4 inches.

In 1940 I was stationed in Ajmer and naturally kept a very sharp look-out for a reappearance of the bird. I heard it calling first on 29th May and again on 13th June, but did not see it on either occasion.

I saw the bird first on 20th June 1940 in my compound and thereafter heard and saw birds of both sexes on numerous occasions and my last record for that year was on 16th August. So far as I was able to make out there were at least two pairs in the railway contonments.

Early in May 1941 I was posted to Ahmedabad. I heard a bird calling in my compound on 25th May and heard and saw it at intervals until the end of June. Thereafter I had no time for bird watching on account of floods and breaches which kept me fully occupied.

These records are scanty enough and the only definite conclusion which can be drawn from them is that the Black-headed Cuckoo-Shrike seems to have extended its range to Ajmer some time between 1933 and 1939. In both 1929 and 1933 I had the opportunity to devote a great deal of time to bird watching and could scarcely have missed a bird with which I had become so familiar in Abu Road, especially as I was posted from Abu Road to Ajmer on both occasions. There was famine in Rajputana from 1938-1940 and it is possible that the bird was forced to extend its range locally on this account.

I do not know on what evidence Hugh Whistler has defined the N.W. limits of this bird. Throughout a hot weather and monsoon spent in Fatehgarh, U.P., I never encountered the bird, nor have I found it at Kotah, Rajputana. Round Baroda it is quite common; far more so, it seemed to me, than round Ahmedabad. It is possibly only a breeding migrant to Rajputana and if this is the case it is probable that it moves up the Aravalli Hills from the south rather than in from the west or north.

1/B, IMPERIAL MANSIONS,
CUFFE PARADE, COLABA, BOMBAY, 5. R. M. SIMMONS
January 17, 1948.

14.—THE STATUS OF THE DUSKY WILLOW-WARBLER [*PHYLLOSCOPUS FUSCATUS* (BLYTH)] IN INDIA

In his 'Systematic Review of the Genus Phylloscopus', published in 1938, the late C. B. Ticehurst gives the winter range of *Phylloscopus fuscatus* as 'Nepal and Sikkim at low elevations; N. Bengal; Buxa and Bhutan Duars; Assam; Manipur; Burma; Shan States, etc. The rest of the winter range is further east. It is the purpose of this note to give evidence for my belief that *Ph. fuscatus* has a much wider winter range in north and central India, and that it has presumably hitherto not been separated from *Phylloscopus collybita tristis*, from which it only differs very slightly in general colour, though the colour of the soft parts and the call-note are quite distinct.

My evidence is based entirely on field observation, and the various species of *Phylloscopus* are so difficult to distinguish in the field that it may be thought that such identification is unsatisfactory. I would point out, however, that the two species here under consideration, namely *Ph. c. tritis* and *Ph. fuscatus*, are both species which habitually feed on or near the ground, so that one may often watch them hopping about at only a few yards distance, when every point of plumage is almost as easy to note as if the bird were in the hand. It will be best, however, if I give my evidence in full, and I must then leave it to the reader to decide whether it is convincing.

The first records are really much too meagre in detail to be satisfactory, and I should not trouble to give them were they not supported by the much fuller details of later observations. It will be noted that most of the observations have been made in the Hoshangabad district of the Central Provinces, but I have notes also from Poona and Allahabad. These observations have in each case been made during short visits to the areas concerned.

My first record is from the Hoshangabad district, C.P., in December, 1942. On Dec. 21st, at Itarsi, I saw a small *Phylloscopus* in a hedge within a few feet of me which, much to my surprise, uttered a weak 'tak, tak' note, totally unlike the shrill note of *Phylloscopus c. tristis.* Three days later, at a village twelve miles away, Makoriya, I saw another, not at quite such close range, uttering the same call-note. On reference to Ticehurst's monograph, I concluded that they must have been *Ph. fuscatus,* but I had failed to record the colour of the softparts or any other details of plumage which might have separated them from *Ph. c. tristis.*

Next, at Poona, on March 18th, 1946, I saw one, or possibly two, of these birds in a hedge, and watched them with my glasses at +7. This bird also uttered the 'tak' call-note. I noted that 'a brown *Hippolais* was in the same hedge and was larger, with longer, compressed bill and looked leggier; also rounder in tail'. But, once again, I carelessly failed to note the colour of the soft-parts.

The first really full note is of a bird seen by the Jumna at Allahabad on Dec. 16th, 1946. It will be best to quote my note written at the time.

'By the Jumna, in the gardens adjoining where I was staying, there were numbers of Siberian Chiffchaffs (*Ph. c. tristis*). They kept to low bushes on the edge of the Jumna river bank, and sometimes flew down and fed among the grass, where they were quickly lost to view. All were silent. In the quarter mile or more that I walked, I may have seen twenty of them. I also saw Lesser Whitethroats and an Ashy Wren-Warbler. Then I found a seeming *Phylloscopus* uttering a rather feeble Lesser-Whitethroat-like 'chack', occasionally. I had very near views of it. It was darker, rather warmer brown than the Chiffchaffs. Eye-stripe fairly conspicuous. Beak as a *Phylloscopus*. But, I thought tail graduated suggesting a *Hippolais*; so perhaps it was *H. rama*. A few yards further on Chiffchaffs kept flying down from a tree onto the marsh. Two were hopping about some plants, when a third bird appeared from off the ground and chased a little. Then it sat in full view. It, too, was a warmer, rather darker brown, definitely buffy on the sides, tail a trifle longer than the Chiffchaff's—and not graduated, the outer feathers being at least as long as the rest. I think it too made the chack note, but I am not certain of this. In any case, it seems to me that this bird must have been *Ph. fuscatus*.'

My next notes are from Rasulia, Hoshangabad, from 8th to 10th Jan. 1947. At midday on the 8th I saw what appeared to be both *Ph. c. tristis* and *Ph. fuscatus,* and later in the day I saw another of the latter. The following are my notes of the latter observation.

'*Ph. c. tristis.* Several were flitting about among some green crops, and flying up to a hedge and tree. Seen at very close range. General colour of upper-parts something like vandyke-brown, slightly olivaceous. Superciliary stripe less distinct than in *Ph. trochiloides viridanus,* an example of which was also in the trees, but extending well behind the eye. Underparts dirty white. Edge of wing yellowish. Bill dark (but variable). Legs black. Silent. *Ph. fuscatus.* Only one seen. Hopping on ground and flying to low branch of tree. Seen at five yards distance, in excellent light. Upper parts warmer brown than *Ph. c. tristis,* but less dark or rufous than in *Acrocephali.* Eye-stripe distinct near bill, but not extending much behind eye. Under-parts dull buffy-white, belly slightly streaked with grey. Bill horn-brown, legs pale brown. Tail definitely square, not round. Actions exactly like other *Phylloscopi,* including 'flicking' action. Note, a low but fairly penetrating 'tscheck, tscheck', uttered fairly frequently. In the case of those (2 or 3) seen at midday I did my utmost to persuade myself that they were really *Acrocephali*: but size, shape of bill and of legs, action, shape, everything made this idea absurd. And I was further fortified by the ease with which I instantly recognised a Blyth's Reed Warbler a few days ago as *not* a *Phylloscopus.*'

'10-1-1947. I have had further views of the *Phylloscopi* on the compound yesterday and today. This morning Mrs. Barnes and I watched two without wingbars hopping on the ground, within five yards. A Lesser Whitethroat was near them. The two on the ground were plainly of different species. In size they were identical, but the following differences were noted. Let (1) be *Ph. c. tristis,* (2) the supposed *Ph. fuscatus.* (1) was grayer above, whiter below, (2) a warmer, somewhat olivaceous brown above, slightly buff below, though distinctly paler on the throat and upper breast than on the rest of the under-parts . The lower under-parts were faintly streaked with grey. (1) has dark lores (2) has pale brown lores, same as colour of face. (1) has a longish, whitish eyestripe. (2) a buff eyestripe, hardly extending behind the eye. (1) has black bill and legs, (2) has brown bill, lower mandible pale, and quite pale horn-brown legs. Both have dark eyes. Later I found (2) again and heard its 'tscheck' note once or twice. Shape of tail and actions of (2) typically phylloscopine'.

I again spent a few days in the Hoshangabad District in January 1948. At Hoshangabad itself I did not certainly see any *Ph. fuscatus* this time, but I saw *Ph. c. tristis* as usual, and also identified at least one *Hippolais* and one *Acrocephalus.* However, spending a few days on the edge of the jungle at Makoriya, the place of the earlier observation in December, 1942, I found several, and had particularly satisfactory views of them on Jan. 23rd. I transcribe my notes as follows.

'First, one seen with several *Ph. c. tristis.* The pale legs very noticeable. Plumage in general slightly warmer. Later: three hopping on the ground together. Colour of legs seems to vary, but all are pale. These three uttered the note, a slight 'tack, tack', fairly frequently. Once or twice one slightly raised its head-feathers, and for a moment I began to think of an *Acrocephalus.* Nor do they flick their wings as much as some *Phylloscopi* do. But their shape, size, general behaviour, etc. is thoroughly phylloscopine. They are much more sprightly than any *Acrocephalus* or *Hippolais* known to me. The beak, too, is typically phylloscopine'. I also saw birds identical in appearance with the above, and uttering the same rather weak 'tack' or 'tscheck' call-note, in the Noakhali District of East Bengal, in late January and early February, 1947.

There is my evidence. No doubt it would be more satisfactory if one or two specimens were available for museum comparison. But I think I have shown that there are birds of the *Phylloscopus* genus which winter in the Central Provinces, apparently also in the United Provinces and possibly even as far west as Poona, whose details of plumage and call-note exactly fit *Phylloscopus fuscatus* and do not fit any species known to winter in those areas.

FRIENDS' SERVICE UNIT,
1, UPPER WOOD STREET, CALCUTTA. H. G. ALEXANDER
February 7, 1948.

[In the 'Distribution' of *Ph. fuscatus fuscatus,* the Fauna (2nd. ed. Vol. ii, p. 462) has overlooked B. B. Osmaston's statement (*J.B.N.H.S.* Vol. xvii, p. 157) that it is common in and around Port Blair (Andamans) in the winter till about end April.

Many of the *Phylloscopi* are notoriously difficult to identify even in the hand, and wellnigh impossible in the field. Ordinarily it is seldom safe to accept sight records without corroborating evidence in the shape of skins. In the present case, however, the editors have little hesitation in accepting the record, not only because of the diagnostic nature of the details observed, but also because of their personal experience of the ornithological wizardry of Mr. Alexander and his field glasses and the uncanny way he has with this very puzzling group of birds.—EDS.]

15.—THE ROSY PASTOR [*PASTOR ROSEUS* (LINN.)] IN CEYLON

I write to record the presence of a flock of some 30 Rosy Pastors at a place just north of Pottuvil, on the east coast of Ceylon, on the 29th December, 1947.

These birds were observed by Mr. L. S. Boys of Colombo who writes as follows :—

'The land was dry pasture with short grass and clumps of trees. I noticed the birds on the ground as I passed 20 yards away. Their pinkish hue attracted me and I tried to approach. This they resented and they took to a nearby tree. As they flew I noticed 5 mynas were with them though not intermingled. The clans kept tgether, a yard or so apart. I went to the car and got my glasses, watched from 60 yards and when they returned to feed, managed to approach to 25 yards from where I had no trouble in watching them for 10 minutes.'

'They were feeding on grasshoppers. The characteristic low crest on the nape was present and I am sure there is no mistake in identification. They are typical starlings.'

I have never previously heard of Rosy Pastors being seen on the *east* coast of Ceylon, but during the winter of 1942/43 a large flock haunted the scrub and plains a few miles from Hambantota, in the extreme south. Usually, however, the Rosy Pastors, on their irregular visits to Ceylon, remain in the Jaffna Peninsula and the dry north westerly coastal districts. They appear never to penetrate the hills or the wet zone.

GALAPITAKANDE ESTATE,
NAMUNUKULA, CEYLON. W. W. A. PHILLIPS
January 12, 1948.

[Regarding the status of the Rosy Pastor in Ceylon, Whistler in 'The Avifaunal Survey of Ceylon' (*Spolia Zeylonica,* Vol. xxiii, parts 3 & 4) writes: 'Occasional winter visitor, odd flocks frequenting the north, south and *east* of the Island'.—EDS.]

16.—OCCURRENCE OF THE INDIAN CLIFF-SWALLOW (*HIRUNDO FLUVICOLA*) IN CEYLON

At 4-30 p.m. on the afternoon of February 8th 1948, while we were having a picnic tea on the Sita Eliya patanas (alt. 5500 ft.) between Nuwara Eliya and Hakgalia in the central hill cluster of Ceylon, I noticed a strange looking swallow sitting, together with a pair of Nilgiri House-swallows (*Hirundo javanica domicola*) on one of the telegraph wires which skirt the Badulla road.

It was a bright sunny afternoon with very little wind and the strange swallow was sitting resting and preening its feathers; it was quite tame and allowed a close approach, so I was able to examine it from all angles, at my leisure, through a pair of x6 field glasses.

Without any doubt, it was an Indian Cliff-swallow (*Hirundo fluvicola*) in immature plumage. Most probably, it would be a straggler that had come over from India (possibly from Himalayas) with a party of Eastern Swallows (*Hirundo rustica gutturalis*)—this species being a migrant that visits Ceylon annually in large numbers during the winter months.

The present bird had the whole head and nape light earthy brown; the back and shoulders glossy steel-blue, with a greenish tinge in some lights; breast and lower parts warm, pinkish buff to white; tail and wings blackish-brown.

I was able to examine it for some ten minutes before it flew off, low over the grassy hill-sides, westwards, and commenced to hawk for insects in a nearby ravine.

As far as I have been able to ascertain, the occurrence of the Cliff-swallow has not previously been recorded from Ceylon; the present record is, therefore, of much interest.

GALAPITAKANDE ESTATE,
NAMUNUKULA, CEYLON. W. W. A. PHILLIPS
February 13, 1948. F.L.S. M.B.O.U.

17.—ARRIVAL OF WAGTAILS IN ASSAM

For some years now the first wagtail seen on this garden has been recorded in our rainfall book. The following dates may therefore be of interest:—

1933	21	Sept.
1934	25	,,
1935	29	,,
1936	21	,,
1937	20	,,
1938	14	,,
1939	18	,,
1940	19	,,
1941	13	,,
1942	14	,,
1943	18	,,
1944	19	,,
1945	18	,,
1946	7	,,
1947	12	,,

Duklingia Tea Estate,
Mariani P.O., Assam. H. P. O. ROBEY
February 20, 1948.

[In Vol. 47 (p. 160) we have a similar note on the arrival dates of the first wagtail (species?) in Upper Assam, and of a ringed individual of the Grey Wagtail near Bombay.—Eds.]

18.—ON THE BREEDING OF THE BLUE-TAILED BEE-EATER (*MEROPS SUPERCILIOSUS JAVANICUS*) IN RAJAHMUNDRI, EAST GODAVARI DISTRICT.

Mr. Humayun Abdulali writes as follows in his 'Birds of the Vizagapatam District' (Vol. 45, No. 3 of the *Journal*, p. 342) on the breeding of the Blue-tailed Bee-eater: 'Nesting in a very scattered colony . . . Waltair . . . These appear to be the southernmost breeding records unless Rhodes Morgan's records (*Ibis* 1870, p. 314) of large numbers breeding in the banks of the Kistna and the Cauvery are correct . . . '

In April 1947 I came across a very small colony of these birds in Rajahmundri. At least three pairs were breeding there on the steep bank of an island formed by the cutting of a canal near the Innispeta cemetery. There were some 11 nest-tunnels of which three definitely belonged to the bee-eaters. The others were probably nests of Pied Kingfishers and seemed to be out of use.

In April 1948 also Blue-tailed Bee-eaters were found always near this island but they were not nesting there. Owing to low water the canal separating the island from the main bank had dried up and a constantly used foot-path ran right through the old nesting place. We searched all likely spots in the neighbourhood but did not find any nests of the bee-eaters.

Blue-tailed Bee-eaters were found in the breeding season farther south, for instance, in Lake Kollair, but I could not discover whether they were breeding there.

It is a pity I did not know in April 1947 that Blue-tailed Bee-eaters were not supposed to breed south of Waltair, for I would have taken greater interest in that colony and made attempts to find out whether there were others in those places where Blue-tailed Bee-eaters were seen in March and April.

K. K. NEELAKANTAN

19.—NIGHTJARS ON ROADS

When I wrote my note (*J.B.N.H.S.,* Vol. 47, p. 162,) I had overlooked the fact that nightjars were only known to take their food on the wing and the editorial note rightly drew attention to this.

Subsequently I saw an interesting article on the American bird, the Pacific Night Hawk (*Chordeiles minor hesperis*) by H. J. Rust in the *Condor* Vol. xlix, pp. 177-188 in which he referred to the birds taking their food on the ground if they had not obtained enough in the air. I wrote to Mr. Rust for further details and he has very kindly informed me that apart from gravel being found in their stomachs (as originally suggested by Stanford) he has noted them jumping short distances and taking insects from low-growing shrubs and herbaceous plants. He adds 'when stomach contents showed heavy feeding on grasshoppers in the summer or early fall, this was direct evidence of ground feeding, as well as contents of wingless ants'.

The Handbook of British Birds also refers to several species of nightjars catching insects on the ground and it is therefore possible that Indian nightjars may also pick up dung-beetles from dung lying on the road.

The editorial comments on my last note state 'it is difficult to agree that the darker road surface has anything to do with the visibility of a bird of such completely crepuscular and nocturnal habits'.

In spite of their very specialized eyes it is difficult to imagine that a nightjar would see a dark patch of dung just as easily on black asphalt as on a paler soil. This is however now only of academic interest as I cannot recall having seen nightjars on pale-coloured cemented roads in suitable localities where dung shows up better than on the adjoining fields.

Motor traffic on asphalted and cemented roads is probably much heavier than elsewhere and, like the American pedestrian, the nightjar must be of two kinds, the quick and the dead. Let us hope the quick ones are not far away. And this raises another question. Does the village chicken still cross our roads? I cannot recall having seen one run over for many years and I wonder if they have now become sufficiently accustomed to motor cars to prevent their rushing about when one is approaching, or if there are fewer chickens. It is unlikely that an acquired characteristic has been inherited and it is more likely that the more excitable chicken has been eliminated. Motor cars also make less noise nowadays.

c/o Faiz & Co.,
75, Abdul Rehman St.,
Bombay.

HUMAYUN ABDULALI

[On the face of it, it may seem absurd to suggest that the chickens which survived became sufficiently sophisticated in time to avoid being run over by motor cars, and were able to pass on this useful accomplishment to their descendants. But that there may perhaps be something more in it than meets the eye is suggested by a communication we have lately received from Dr. Robert Cushman Murphy of the American Museum of Natural History, New York. This was in reply to a request for information concerning a newsitem, which our papers recently published, of large numbers of migrating birds meeting with disaster by dashing into the Empire State Building at night. Dr. Murphy writes that such accidents are not uncommon, but that the curious thing about them is the mysterious way in which birds learn to avoid towering obstacles in time. For instance, in the early years after the Statue of Liberty was erected in New York harbour, catastrophies of this nature were far more frequent than now. And so it is with lofty skyscrapers.—Eds.]

20.—'OCCURRENCE OF THE LAGGAR FALCON (*FALCO JUGGER* GRAY) AT MT. ABU'—A CORRECTION—AND NESTING OF THE SHAHIN FALCON (*FALCO PEREGRINUS PEREGRINATOR* SUNDEVALL) AT MT. ABU.

With reference to Major R. K. M. Battye's note in the December 1947 issue of the *Journal* (Vol. 47, No. 2, pp. 383/4), our attention was drawn by K. S. Dharmakumarsinhji of Bhavnagar to certain features in the description of the young birds in the nest which suggested that they were not Laggar but more likely Shahin (*Falco peregrinus peregrinator*). These discrepancies had inadvertantly been overlooked by us. K. S. Dharmakumarsinhji who has considerable experience with falcons in the wild state as well as rearing and training them from young, said that while he had seen a few immature examples with reddish-brown underparts and brown upper plumage, he considered it rare or exceptional to find two young Laggar in a nest *both* of which had bright reddish-brown lower parts with black streaks, and black upper parts as described by Major Battye. He rightly pointed out that most Laggar fledgelings are dark brown to blackish-brown above, and almost blackish-brown below. Another and more significant point to which he drew attention was that the legs of the young birds were described as bright yellow, whereas in young Laggar they are invariably slaty-blue, bluish-grey or sometimes greyish-white.

In reply to a further reference Major Battye writes that as the young birds were in a recess in the cliff, he may possibly have made some mistake concerning their plumage colouration but confirms that their legs *were* bright yellow. This, in our opinion, settles the point that the birds in question were not Laggar.

Although nesting has not been specifically recorded from Mt. Abu for the Laggar Falcon or the Shahin, there would seem nothing unusual in either species being found to do so. With the corroborative evidence brought out in this correspondence, the present may well be accepted as a reasonably authentic instance of the Shahin nesting at Mt. Abu.

114 Apollo Street, Fort, Bombay.
June 7, 1948.

EDITORS

21.—SNIPE ON THE NILGIRIS

The common snipe of the Nilgiris plateau is the Pintail, but other species are occasionally met with, and the following table of birds shot by Mr. R. F. Stoney and myself shows the comparative frequency of the different varieties:—

		R.F.S.		E.G.P.A.		
Fantails	...	19– 1–40		19–10–23		
		23– 1–42		22–12–23		
				4– 3–48	Total	5
Jacks	...	5– 3–33	seen but not shot	31–12–23		
		16– 2–28		5–11–28	Total	4
Wood	...	5–12–33		2– 1–26		
		15– 2–35		29– 1–27 (2)		
		6– 2–37		2– 1–28		
		16– 2–38		16– 2–29		
		2– 3–39		29–10–29		
		17–12–40		10– 2–36		
		7–12–45		16– 2–37	Total	15
Swinhoe	...	17–11–33		Nil		
		13–10–35 (2)			Total	3
Pintails	...	973		696	Total	1669

Mr. Stoney's records are from the season 1931-32 and mine from 1923-24, but I shot very little on the plateau after 1930. There has been a considerable diminution in snipe in recent years. Since 1941 Mr. Stoney has shot only 53 in 7 years, as compared with 150 in 1937 and 134 in 1938. My own experience has been similar. As regards dates of arrival and departure, a few birds come in each year at the end of August, but the first regular flight does not arrive till about the middle of September. Practically all are gone by mid-April, though a few odd birds may be found as late as 4th May.

KALHATTI, NILGIRIS. E. G. PHYTHIAN ADAMS,
April 26, 1948. *Lt.-Col., I.A.* (Retd.)

22.—SNIPE IN SOUTH INDIA.

The following table of snipe shot between 1923 and 1948 is compiled from my game book and shows the comparative frequency of the different species. The majority were bagged in Malabar, but a fair number in the Mysore and Bangalore districts, and a few on the Nilgiris and in the Wynaad—all being adjacent areas. The best day's bag in Malabar was 102 and in Mysore 71—both in 1939. Round Bangalore a bag of 20 couple to 2 guns was considered good, but at Cannanore 30 couple were frequently obtained by a single gun in a day; on the Nilgiris a bag of 10 couple is unusual.

Season	Pintail	Fan'ail	Jack	Swinhoe	Wood	Total
1923-24 ...	173	26	1	...	...	200
1924-25 ...	124	29	...	...	...	153
1925-26 ...	173	51	3	2	1	230
1926-27 ..	405	83	3	1	2	494
1927-28 ...	317	42	3	2	1	365
1928-29 ...	569	99	15	...	1	684
1929-30 ...	397	232	1	1	1	632
1930-31 ..	562	155	4	3	...	724
1931-32 ...	754	205	30	2	...	991
1932-33 ...	974	149	10	2	...	1,135
1933-34 ...	527	93	5	1	1	627
1934-35 ...	468	138	13	3	...	622
1935-36 ...	626	184	4	...	1	815
1936-37 ...	452	257	23	...	1	733
1937-38 ...	708	260	19	1	...	988
1938-39 ...	840	279	19	6	...	1,144
1939-40 ...	442	103	2	...	...	547
1940-41 ...	387	121	1	2	...	511
1941-42 ...	420	171	13	1	...	605
1942-43 ...	286	157	7	...	...	450
1943-44 ...	287	125	12	1	...	425
1944-45 ...	349	36	...	...	1	386
1945-46 ...	204	43	4	1	...	252
1946-47 ...	228	41	1	...	...	270
1947-48 ...	110	11	1	...	...	122
Total ...	10,782	3,090	194	29	10	14,105

From the table it appears that Pintails are approximately 3 times as numerous as Fantails in South India, and that some years are noticeably better than others for Jack Snipe.

Of the Swinhoes, 22 were shot in Malabar and 7 in Mysore, and I would add that all were carefully identified and do not include any of the abnormally large Pintails which one meets from time to time. Of the Woodsnipe two only were shot in Malabar and the rest on the Nilgiris plateau.

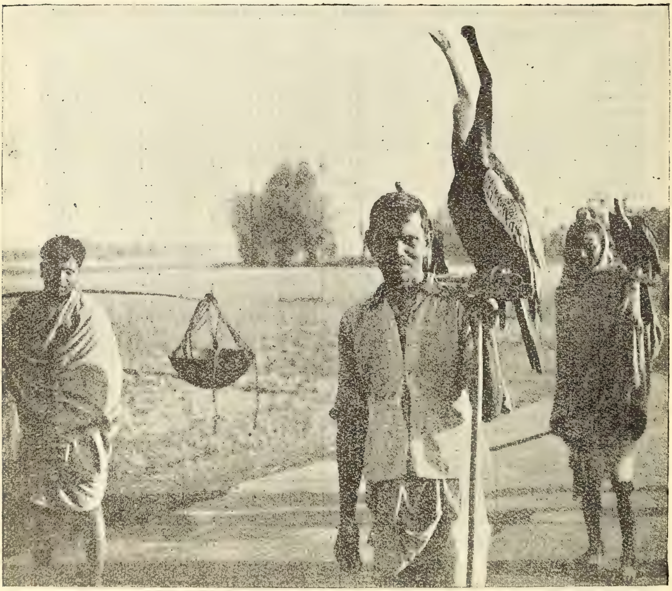
I have only one record of a semi-albino snipe: a Fantail with white wings shot in Malabar.

Kalhatti, Nilgiris. E. G. PHYTHIAN ADAMS,
April 26, 1948. *Lt.-Col., I.A.* (Retd.)

23.—FISHING WITH THE INDIAN DARTER (*ANHINGA MELANOGASTER*) IN ASSAM.

(*With a photo*)

In February 1948 I met a party of about twelve men journeying along the main Assam trunk road, and carrying with them six Darters (*Anhinga melanogaster*). The birds were completely tame, and were quite oblivious of passing traffic. They were carried on long bamboo yokes across their owners' shoulders, as the accompanying photograph shows.



I was informed that the party came from the district of Dhubri in north-west Assam, where they use their Darters as a regular means of catching fish in the swamps and small lakes adjacent to the Brahmaputra. Since they were some sixty miles from their village when I met them I enquired why they were travelling with their birds. They told me that during the dry season they often leave home and 'vagabond' through the country, catching fish as they go and trading it in on the spot for rice and other goods. The party was quite self-contained when I met them, and those who were not carrying birds had bedding, cooking utensils etc. I have since been informed by Mr. W. Shaw M.B.E., A.C.S. (Retd.) that when he was district officer at Dhubri some years ago he often saw the local villagers using their Darters; first putting a ring round their neck, and then launching the bird. On returning with a fish it was at once given a small piece before sending it out again.

The men I met were Hindus, but Mr. Shaw tells me that he has most often seen Muslims fishing in this way: so that there seems to be no question of a special 'Darter-fishing' caste.

Two reliable informants have also told me that either Darters or Cormorants are used in Manipur State on the Burma border for catching fish in the great Logtak Lake.

March 7, 1948. C. R. STONOR

[Fishing with trained cormorants is still commonly practised in China, and to a limited extent also in Japan. We were not aware of Darters being employed for the purpose or that this 'biological' method of fishing was in vogue anywhere within our limits. Why Darters should here be used in preference to cormorants is not clear, since the former's narrow head and slender neck naturally makes it possible for it to tackle only much smaller fish than the cormorant can.—EDS.]

24.—THE DWARF OR LESSER WHITE-FRONTED GOOSE [*ANSER ERYTHROPUS* (L.)] IN INDIA: AN AUTHENTIC RECORD?

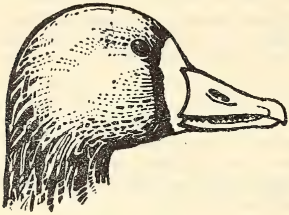
(*With a text figure*)

Mr. J. L. Hay of 3/2A Auckland Street, Calcutta, recently intimated having shot on 15 February 1948 a couple of Dwarf or Lesser White-fronted Geese at Karahgola on the Ganges, near Sahibganj, Santal Parganas—Bihar.

His attention was first drawn to a batch of 8 geese which struck him in the field as different from Grey Lags and Bar-heads. They were smaller and of a darker plumage. Their alarm call, after the birds were fired at and were flying away, was 'an abrupt, mellow, musical whistling honk, rather soft though not wholly unlike a goose'.

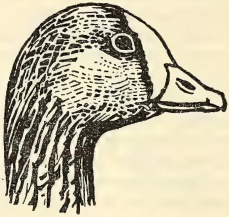
The most outstanding markings in the 2 examples shot were a splash of white on the forehead commencing from the top of the beak up to a point approximately between the eyes. The lower breast and belly were marked with heavy sooty black blotches. The soft parts were noted as follows: 'Bill $1\frac{1}{2}''$ and of a pale flesh pink. Eyes dark brown. Edges of eyelids fringed with thin lemon yellow skin (the most distinctive feature in my opinion). Legs bright orange yellow'.

The differences between the White-fronted Goose [*Anser albifrons* (Scop.)] and the Dwarf or Lesser White-fronted Goose [*Anser erythropus* (L.)] are slight, and can be easily overlooked. It needs critical examination to differentiate the two species and there is no doubt that records are often confused and undependable.



1.

1. White-fronted Goose.



2.

2. Dwarf Goose.

According to Stuart Baker (Fauna, Vol. vi, p. 401) '. . . . In India it only occurs in very small numbers but has been recorded from Sind, Cashmere, North-West Provinces, United Provinces (more frequently), Calcutta and Assam'. It may be recalled that on this statement Dr. C. B. Ticehurst commented (*J.B.N.H.S.*, Vol. 34, 489) 'I should accept no records of this bird in India at all, unless a specimen or head was forthcoming as it has so frequently been mixed up with *albifrons*'.

Were it therefore not for the fact that Mr. Hay makes special reference to the yellow eyelids, which is really the most significant diagnostic character of the Dwarf Goose, we would have been inclined to follow Dr. Ticehurst's advice. In the present case, moreover, Mr. Hay's description of his birds is confirmed by his fellow-sportsman Mr. S. E. Robertson of Sahibganj, Bihar, who claims over 40 years' experience of shooting duck and geese in that locality and of vetting bags.

114 Apollo Street, Fort, Bombay.
July 15, 1948. EDITORS

25.—THE WHITE-FRONTED GOOSE [*ANSER ALBIFRONS* (SCOP.)] IN MANIPUR, ASSAM.

With reference to the letter of Colonel Hurrell of January 10th, 1947, on page 168 of Vol. 47, No. 1 of the *Journal*, may I point out that the White-fronted goose (*Anser albifrons*) has been recorded in Manipur on at least four occasions between 1916 and 1931, *vide* my note, 'Game Birds and Animals of Manipur', page 414, Vol. 36, No. 2 of the *Journal*.

Alford, Lincolnshire. J. C. HIGGINS,
February 14, 1948. *I.C.S.* (Retd.).

26.—WHITE-WINGED WOOD-DUCK [*ASARCORNIS SCUTULATUS* (MÜLLER)] ON THE PADMA RIVER, EAST BENGAL.

On February 2nd, 1947, I was on the steamer travelling from Chandpur to Goalundo, up the Padma river, when I noticed a flock of large ducks on the river in front of the boat. Before they flew towards the side of the river, we had come within perhaps, a hundred yards of them, so I had good views through my binoculars. The general plumage was black, the head grey and there was a conspicuous patch of white in the wings. The birds were in two parties, and I estimated that altogether there were some thirty individuals. With one party was a smaller duck, which appeared to be a Grey Duck (*Anas poecilorhyncha*). The larger birds can, I think, only have been White-winged Wood-Duck (*Asarcornis scutulatus*). At the time I supposed it might be not unusual for them to come out of their normal woodland habitat onto open rivers in the winter. But it appears that there is little or no previous evidence of any such seasonal movement.

FRIENDS' SERVICE UNIT,
1 UPPER WOOD STREET, CALCUTTA. H. G. ALEXANDER
February 7, 1948.

27.—BRONZE-CAPPED TEAL [*EUNETTA FALCATA* (GEORGI)] IN ASSAM.

Shooting on 24-25 January last over 'bheels' in the Sibsagar district one of the guns killed a ♂ Bronze-capped Teal. The bird was in beautiful condition with the falcated feathers well developed.

I have the skin—unfortunately this first effort at skinning a bird was not very successful and I had to sever the head from the body.

DUKLINGIA TEA ESTATE,
MARIANI P.O., ASSAM. H. P. O. ROBEY
February 20, 1948.

[Moore obtained three young females at Dibrugarh, Lakhimpur Dist., Assam (*J.B.N.H.S.*, xv, p. 141). Inglis procured a specimen at Tirhut in Bihar, and keeping a lookout for it got seven more in the next season, xiii, pp. 180 and 378). Other published records are from Samastipur, Bengal (xxxviii, p. 195), Patna, Bihar (xl, p. 332) and farther west from Jhelum, Punjab, and Roorkee, U.P. (xxxv, p. 459), Sind (xiv, p. 149) and Kutch (xxxv, p. 899).—EDS.]

28.—GEESE, DUCK AND TEAL IN SOUTH INDIA.

The following tables of geese, duck and teal shot between 1925 and 1948 are compiled from my game book to show the comparative frequency of the various species. The great majority were bagged in the Mysore district, a few round Bangalore and odd birds picked up while on tour in the Northern Circars and Ceded Districts.

The following notes are added in amplification of my article on 'Small Game Shooting in Mysore' published in *Journal* No. 3 of Vol. xli in April 1940:—

(1) All the geese are Bar-headed; I have never heard of the Grey-lag in South India.

(2) Under the head of Pochards are included one Red-crested shot at Cumbum in the Kurnool district[1], three White-eyed, and 9 Tufted.

Season	Geese	Pintail	Spotbill	Wigeon	Shoveller	Pochard	Gadwall	Brahminy	Comb Duck	Common teal	Garganey	Whistling teal	Cotton teal
1925–26	—	4	36	—	4	—	—	—	—	3	33	—	10
1926–27	4	8	69	4	5	—	—	—	—	3	50	—	—
1927–28	1	5	34	1	19	—	—	—	—	1	39	3	2
1928–29	—	6	17	13	22	—	1	—	—	34	21	—	—
1929–30	6	10	38	2	14	1	—	1	—	8	122	13	9
1930–31	13	24	31	—	4	3	—	—	—	4	69	5	35
1931–32	1	10	30	—	8	—	—	—	—	2	61	4	75
1932–33	3	33	—	3	—	—	—	—	—	1	43	7	26
1933–34	—	4	29	—	—	—	—	—	—	—	17	—	4
1934–35	—	17	34	—	13	5	—	—	—	27	114	—	64
1935–36	—	20	32	—	13	—	—	1	—	14	166	2	168
1936–37	1	12	37	2	5	3	—	—	—	13	87	19	153
1937–38	—	36	89	—	22	7	—	—	—	19	152	12	285
1938–39	2	10	60	2	44	26	—	—	—	20	291	10	531
1939–40	—	15	55	1	21	5	—	—	—	6	256	17	871
1940–41	—	4	14	—	4	—	—	—	—	—	9	—	110
1941–42	—	17	20	—	11	2	—	—	1	5	172	10	200
1942–43	—	16	31	1	14	2	—	—	1	12	120	2	58
1943–44	—	10	17	1	6	1	—	—	2	14	59	—	25
1944–45	—	4	26	—	—	—	—	—	—	—	37	8	17
1945–46	7	6	111	—	19	1	—	—	—	2	224	6	189
1946–47	—	12	32	—	11	—	—	—	—	4	45	1	13
1947–48	—	6	117	—	33	7	—	—	—	4	292	4	250
Totals	38	289	959	30	292	63	1	2	4	196	2,479	123	3,095

Grand Total ... 5,893

(3) The single Gadwall recorded was shot near Gundlupet in the Mysore district.

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[1] This was published (*J.B.N.H.S.*, 44, p. 130) as the records from southern Madras Province appeared to be so scanty. In the same number of the *Journal* Aubrey Buxton recorded seeing big flocks of Red-crested Pochard in the Salem Dist. (p. 120). Curiously enough it would seem to be one of the commonest duck in the Vizagapatam Dist. (xii, 575) where Stephen Cox recorded as many as 223 during a single season, the most numerous species in the bag being Gadwall (260). More recently H. G. Lumsden shot 4 Red-crested Pochard and saw about 200 on Tyravallur tank about 30 miles from Madras (46, p. 549).—EDS.]

(4) Brahminy—one shot in Mysore and the other near Cannanore in Malabar.

(5) Comb ducks—3 shot near Bangalore, and one near Gundlupet.

(6) Whistling teal include one of the large variety shot on the Cubbany river at Nanjangud, (Mysore) and five of the lesser shot near Masulipatam—the latter proved excellent eating in contrast to a few Pintails and Garganey bagged near Ellore (W. Godavari) which were so fishy as to be uneatable.

(7) So far as I know the Mallard has never been recorded in South India. A note published in the *Journal* some years ago that they were not uncommon in Coimbatore appears to have been due to confusion with the male Shoveller, which in breeding plumage to some extent resembles the Mallard. Variations in bags are largely due to the strength or weakness of the N.E. monsoon. If the latter is strong, all the tanks are full and the birds scattered. On the other hand if it fails, as happened in 1947, the birds are concentrated on the few tanks which hold water. In an average season I think that anything over 100 head in a day may be considered satisfactory. Only twice in the past 23 years have we passed the second century, with 202 to 3 guns on 5th April 1942, and 205 to 4 guns on 27th March 1948—both of these bags included some snipe and pigeons. Our best bag of duck was 68 Spotbills and 1 Shoveller to 4 guns on the 28th March 1948 the total for the day being 114, and for 2 consecutive days 319. But it is very seldom indeed that 30 duck are obtained in one day, and one relies chiefly on garganey and cotton teal to fill the bag.

KALHATTI, NILGIRIS.
April 26, 1948.

E. G. PHYTHIAN-ADAMS,
Lt.-Col., I.A. (Retd.)

29.—'THE BIRDS OF DELHI AND DISTRICT'

Since the above paper (*Journal, B.N.H.S.*, Vol. 47, No. 2, p. 277), was written additional information has been collected chiefly by H. A. C. Gill and C. R. Cooke, extending the periods in which winter visitors have been recorded, and adding other data, as follows:—

Stone-chat—April (27th).
Pied Wheatear—Noted from October to February (16th).
Bluethroat—May (2nd).
Black-throated Thrush—December (16th).
Blue Rock-Thrush—December (8th).
Hume's Willow-Warbler—Noted from December to February.
Streaked Wren-Warbler—December (24th).
White-capped Bunting—Noted from January to March.
Common Swallow—December (26th).
Brown Rock Pipit—December (8th).
Crested Lark—May (20th).

Blossom-headed Parakeet—Noted from September to end of March.

Blue-cheeked Bee-eater—Summer visitor.
Numbers seen near the River Jumna in May (18th and 20th). [race needs confirmation.—Eds.]

Common Indian Nightjar—Chiefly summer visitor with some residents.

Lugger Falcon—April (27th).

Kestrel—March (1st).

Long-legged Buzzard—Noted in March. [species ?—Eds.]

Common Green Pigeon—Fairly common but very locally distributed.

The Little Button Quail [*Turnix dussumieri* (Temm. & Laug.)] Status not known. Uncommon. A pair seen once only in cultivation near River Jumna in April (20th).

Little Tern—Resident. Pairs nesting on sandbanks of River Jumna in April and May. [race?—Eds.]

Sociable Plover—December (1st).

Avocet—Small parties on River Jumna in April (6th and 14th).

Black-tailed Godwit.—Definitely identified on River Jumna in April (17th and 20th).

Greenshank—August (18th).

Pelican—March (23rd).

Spoonbill—May (2nd).

Glossy Ibis—Party of 6 seen near River Jumna in April (20th).

Cotton Teal—Shikar records from September (16th) to November (3rd).

Grey-Lag Goose—Noted in November.

Ruddy Sheldrake—Noted to end of April and a few stragglers in May (2nd).

Spotbill—November (10th and 17th) and March (10th).

Gadwall—Seen in September and October and shot from November (5th) to March (23rd).

Wigeon—From November (3rd) to March (26th).

Common Teal—August (24th).

Blue-winged Teal—From October (8th) to April (27th).

Red-crested Pochard—Pair seen in November (17th).

Common Pochard—Occurs infrequently in recent shikar records,—November (5th), December (10th). Small party on River Jumna at Okhla, December (5th).

White-eyed Pochard—Reported in recent shikar records as common from October (8th) to March (11th).

Tufted Pochard—Not at all common. Occurs occasionally in recent shikar records from November (5th) to March (11th). Small parties.

Great Crested Grebe—Winter visitor. Uncommon. Seen on River Jumna in December (10th) and noted in shikar records as occasionally occurring on large jheels during the cold weather.

N. F. FROME

30.—MORTALITY WITHIN NESTS OF TROPICAL BIRDS

In his article on Bird Life in an Assam Jungle, Betts (*J.B.N.H.S.* 46:669) states that 'the casualties . . . were positively catastrophic and must surely have been exceptional.' He speculates that giant squirrels and monkeys on the area could have been responsible. The losses, it must be admitted, are catastrophic, as in the case of all six nests of *Otocompsa emeria* which were destroyed. The writer has had similar discouraging results at Barro Colorado Island in the Panama Canal Zone where nests of passerine species or of hummingbirds were more often than not, robbed before hatching. Betts's findings sound remarkably analogous to the fate of nests of a species like *Thamnophilus punctatus*, an ubiquitous bird of the Panama rain forest. In both cases the percentage of failure is relatively enormous, although the species concerned probably are not in danger of diminution. Thus, it would appear that, beset by numerous predators, the breeding adults lose many eggs and nestlings but are as adults relatively free. My point is that the high loss of nests in the tropics may likely be found, not exceptional, but quite normal.

There has been so little work on life histories of birds of the lowland tropical rain forests that bird watchers find it difficult to accept the tremendous losses as a normal situation. Still, our colleague in India may compare notes with no less an authority than Dr. Alexander Skutch who writes (*Sci. Monthly* 51: 506) that in lowland rain forests in Panama six out of every seven nests studied were prematurely destroyed, but that on the other hand, in the high mountains of Guatemala 55% of the nests produced at least one fledgling! Losses in the lowlands are due to monkeys, Swainson's Toucans but mostly to snakes. To ascertain quantitatively the causes of high nest predation is a challenging field of study for those ornithologists who reside in lowland tropics.

EASTERN OREGON COLLEGE,
LA GRANDE, ORE., U.S.A. CHARLES W. QUAINTANCE
March 8, 1948.

31.—MY EXPERIENCE WITH PHEASANT BREEDING IN DHARMSALA CANTONMENT.

In my capacity as Honorary Secretary of the N.I. Association for the Protection of Wild Life, I felt it incumbent on me to work out ways and means for increasing 'game' which bid fair to be very fast depleted.

I very soon realised that whereas protection through Game Laws, and the resultant punitive measures, was the normal way to stop the excessive slaughter of game, it was only effective in so far as it dealt with the protection of birds during the breeding season. For the rest, the taking out of licences to shoot merely had the effect of putting money which accrued from the sale of licences, into Government coffers but was completely useless from the point of view of protection. It only meant that if the vigilance of forest guards and game inspectors was sufficient to make poaching a very risky proceeding, combined with the co-operation of magistrates who were prepared to give deterrent sentences, then the erstwhile poacher became an honest man, paid his fees and became a licensee.

If on the contrary guards and inspectors were not difficult to get round, or the magistracy was very much of the *mehrbani* type and thought a nominal fine of Rs. 2 covered a venial offence, then very obviously the poacher remained a poacher, and saw no reason why he should pay Rs. 5 or Rs. 8 for a shooting licence, when he could shoot more or less with impunity for nothing, or at most, run a very small risk of being challaned and fined Rs. 2.

However, whether a poacher remained a poacher, or became a licensee, made only a small difference to Government coffers, but not one iota of difference to the unfortunate game, as in either case the poacher and the licensee were 'killers' under different names.

There you have the whole crux of Game Preservation in India, so a department of Government using punitive measures to protect game is only out to alienate the sympathies and confidence of the public, for however carefully run, abuse of power is certain to follow in its wake and one such abuse will counteract the effect of many benefits in the public mind.

What then is the remedy?—Breeding birds to increase their numbers.

If this is done on a large scale the effect is two fold, or even three fold, viz:—(*a*) You can keep your licence fees low and still give the licensee his heart's desire in the large increase of game to shoot. (*b*) You can breed game separately for hotels and hostels which are, now, the largest source of destruction, paying, as they do, high prices for game and thus inducing netting and noosing on a very large scale. (*c*) You are winning the confidence of the public as a Government that is really out to do something, to hand over to posterity as good or better conditions than it inherited from the last Government.

Finally, if Government could see their way to give to the zemindar the right to the game found on his own property, an interest would be established which would do more for birds and beasts than anything else.

If then we accept the axiom that breeding is the only way of really increasing game it is necessary, in the first place to see how we should go about it. I began with Kalij pheasants as these were the common pheasants of the district and best suited to the height at which I wished to try my experiment. I propounded my scheme to the Committee of the N.I.A.P.W.L. and the Association met me half way and agreed to pay for the pen I proposed to put up. Very fortunately I had exactly the type of land I wanted in my own grounds, viz.:—fairly well drained terraces covered with oak trees and oak scrub. Since pheasants perch on trees at night, it was obvious that perching branches, some 12 to 15 feet above ground, must be fenced in. I selected a site about 100 ft. by 30 ft., on which even the monsoon rains could not lie, and erected a wired-in pen to take in the whole area selected. Right round the whole area the wire netting was of ½ inch diameter to keep out possible snakes and rats. This extended some 6 inches inward, along the ground and 2 ft. 6 in. upward, above the ground. The next layer of 3 ft. width was interwoven on to the top of the original small mesh wire, and was itself of 1½ in. mesh, you thus had the sides of the pen 5 ft. 6 in. in height, to enable a man to walk about inside, when necessary, with comfort. Just where the roosting perches are to be, the sides must be raised considerably so that the top netting will cover them with nearly 2 ft. to spare, and for the rest the netting on top will remain 5 ft. 6 in. from the ground, and running up to possibly 12 to 15 feet over an area of say 10 ft. × 8 ft. where the birds perch.

It is not sufficient to merely have the perching branches in evidence at 12 ft. or so above the ground, but young scrub and lower branches coming down almost to the ground, so that later on the chicks can hop up from branch to branch and roost with their parents. Having satisfied yourself that your pen is just what is needed to keep your birds in, and at the same time to keep out rats, mongooses and snakes, you look well over the inside of the pen. If you have an old terraced field where the pen has been erected, then on the upper side you will have the remnants of an old wall and if no such thing exists, then you must build up an earthen butt say 3 ft. high and 6 ft. long with the upper side built up with earth and stones and covered with slate to keep out the rain. Into the face of this butt insert two or three hatching boxes, made of wood a foot long and the same in height and breadth, but with the front side cut away to within 2 in. of the bottom to give free passage to the sitting hen. If this box is plastered with greyish or brown colouring to represent a hollow in a boulder so much the better. A little earth at the bottom and on it a few blades of grass will constitute a sufficient nest for the eggs to be placed. It is essential that these boxes should be let in deep into the butt so that they are dark inside and not subject to a glare, and just high enough from the ground to be above any water that may lie. A couple of large projecting boulders within the pen would supply natural nests for the birds, the only condition necessary being they are well covered from the rain, i.e. the nest below them would be rain proof and the surrounding ground below the level of the nest.

A cock and four or five hens would produce by the end of June or early July, an average of 12 to 13 eggs per bird. Do not let curiosity kill the cat. You will soon know that eggs have been laid by the birds not being keen to come out for their food when thrown in for the first day or so. Thereafter the eggs will not hatch out on the 21st day as in a fowl but on the 25th day, and thereafter the pen will be alive with the most active little chickens you have ever seen. The parents will look after them and you need not worry yourself in the least bit, except to give them their food regularly.

Feeding and cleaning the pens.—The man who is to look after the birds must be a person with a little common sense, and it must be dinned into his head that he is dealing with very shy and nervous birds, hence his every action must be slow and deliberate so as not to frighten the birds. He should begin to sweep out the pen on the side opposite to where the pheasants have collected on his arrival, then work very slowly round and the birds will run on ahead of him. If this is done daily the birds will get quite used to him in a week or so, especially if he feeds them as soon as he has finished sweeping. The grain, wheat, bajra, mukki, barley and rice should all be tried mixed together. You will soon see which, if any, they discard and which they like best and act accordingly. A handful per bird in the morning and the same in the evening, with a feed of *choker* (bran) mixed with raw meat, or better still, worms, at midday.

Pheasants, both grown up and chicks enjoy all kinds of worms and insects and if you have any water channels that are very often dry you may find under the surface, some 2 to 3 inches down in the mud, the grub of the crane fly or as the fly is commonly called daddy-long-legs, which they will devour greedily, also the grubs of all beetles. By giving them this diet you help your pheasants as well as your garden, as the crane fly grub is most destructive. I used to give a couple of *chokras*, the sons of my servants, for every cigarette-tin full they brought me As. 2, every second day. Accustom them to this diet gradually and do not give too many to start with.

If wild pheasants are to be found in the vicinity it may become necessary to erect a wire fence a couple of feet away but all round your pen as the wild cock is certain to come round and challenge your bird and the fight is a very serious one, even with wire between and I have had my pheasants eyes put out, on one occasion, and was able to catch the wild one, whose head was cut to pieces and he was too exhausted to fly away when I approached.

The above pens can be improved upon and enlarged a hundred-fold if required. The only *desideratum* is that two cocks do not get together so there should always be a partition in between the pens. A cock can accommodate half a dozen hens.

If it is intended to breed pheasants on a very large scale then the above method is uneconomic. In that case you have a large enclosure, preferably with a stone or mud wall all round and covered by wire netting above, to keep the pheasants from getting out and kites and other predatory birds from getting in. The pheasants should not be allowed to build nests but encouraged to lay their eggs on the ground. Every evening these should be picked up and ultimately, when you have enough, put into an incubator to hatch out. In this way each pheasant will lay up to 20 or more eggs, instead of the usual 12 or 13. When the chickens are hatched they should be handed over to a brooding fowl which has been introduced into a separate pen and kept in a coop with bars in front through which the chicks can run in and out but the fowl cannot.

Thus the chicks will soon learn to run to the foster mother hen when she calls them and she will keep them warm at night.

PARTRIDGES.

For grey partridges the procedure would be somewhat similar but the pens need not be so high, and 5 ft. should be ample. The ground should be covered with brushwood under which the birds can not only get plenty of shade but cover from birds of prey. In fact it would be wise to place grass over the upper layer of wire netting. A number of partridges in a pen might very easily panic should a hawk attack from above, and a panic among them might very easily mean the death of several, as they are very strong fliers and one going into the wire netting at full speed would easily break its neck.

Choose a place where there are white-ant nests. These will provide the young with that very desirable food—white-ant ova. Be very careful from observation of a day or two previous to building your pens that the white-ant castles do not harbour a cobra or two, or your partridges will be devoured before they get going, and the eggs will disappear as soon as they are laid. Also make sure the place is not infested with rats. If there is water on it, or flowing through it so much the better.

It might be worth your while planting a little wheat or other grain on one side of the pen to ensure green food which is very necessary for both partridges and pheasants.

Hang a lantern near the middle of the pen. This will attract insects at night and give the birds a small supply of live food.

For the rest a little experience will provide more material than 20 pages of writing from me. Always remember that the birds, both partridges and pheasants should not be frightened unnecessarily and the tamer they become the better mothers and layers they will make. Always approach cautiously, throw in their grain or whatever food they are getting and walk slowly away. In a short time they will get over their fear of man and look forward to the keepers approach as it means food and drink. Use your common sense in all matters.

25th February, 1948. C. H. DONALD

32.—PARAKEETS ATTACKING A SNAKE

At 11 a.m. on 15th December 1947, while walking along a road in Poona Cantonment, the vociferous screeching of parakeets (*Psittacula krameri* Scopoli) attracted attention. The cacophony of these birds emanated from a nearby pipal tree (*Ficus religiosa*). The tree in question—an old and tall one and in actual fact a composite of three trees fused together—stood in the compound of a bungalow not more than thirty yards from the low wall bounding and adjacent to the public road. At about a height of forty feet from ground level there was a visibly shallow and slightly sloping hollow formed by the tree's thick branches curving upwards. This hollow was bathed in sunshine and in it a snake—a subadult, about four and half feet long—was clearly discernible. Having made a study of the Ophidia, I am in a position to say that it was a specimen of the Rat Snake. (*Ptyas mucosus* Linn.)

Six parakeets—the main actors in the play—were aggressively attacking the snake. At first, two mynas (*Acridotheres tristis* Linn.) and later more additions of this species had gathered around as spectators,—joining in with their raucous calls to swell the bedlam of parakeet screeches.

The *modus operandi* of the parakeets—all of them unafraid and screeching more in rage than terror—appeared in the mêlée, as a rough and tumble attack carried out in relays of green, sun-lit, feathered bundles of two, three, and sometimes four birds crash-landing on the snake in two separate lengths of its body. The upper portion of the victim was extended along one of the thick branches of the tree with the head lifted clear and swaying, and turning in all directions in a frantic endeavour to find some way of escape. The middle and major portion of the body showed as a heaped-up mass filling the hollow. The lower and shorter tail-end section appeared glued in a grip on a bend in one of the branches below the hollow.

It should be noted that the screams of the birds commenced at a time when the writer was abreast of the spot. So that the whole incident was witnessed from start to finish—a period timed by the watch of eight minutes and a few seconds over. Fortunately the sun in lighting up the scene made the details of the proceedings quite clear. At no time during this period did the snake attempt to defend itself or strike out at the birds. On the other hand it seemed, that in the clamp of fear, it had lost all retaliatory initiative. The only manifestations on its part were ineffectual endeavours to escape somehow.

Thus the tussle continued in a series of birds, viciously biting with their red beaks and clawing in a dance, while their wings kept beating to maintain balance. All of those birds in the attack, rising and falling on the heaped mass of a convulsively tossing and wriggling snake painfully reacting to the bites inflicted—all of which, no doubt, must have been deeply penetrating. But alas! there was no evidence of ophidian aggression in defence to warrant this unusual affair in Nature being called a Battle Royal.

The climax as a prelude to a disappointing finish became centred and confined to one bird only. It may have been that owing to physical exhaustion, this hero or heroine—no rose ring around the neck was visible—changed the tactics on its own initiative by descending the branch in an ungainly 'Cake Walk'—assisting the body balance by gripping with its beak the rough excrescences on the branch. Having approached the victim it seized in its beak the part of the snake's body nearest to it. It did all this, while its comrades continued with the former method of attack. It then took to wing through a gap in between two of the three thick branches, forming the hollow. In doing this, and while maintaining its beak-hold, it dragged the major length of the snake's body with it. The pull by the bird, the weight of the snake, and the force of gravity, resulted in the whole length of the snake being freed from the hollow and hanging pendant momentarily—just for a split-second—in which the spectacle was presented, on the one hand of a writhing frenzied serpent in the grip of a parrot's beak and on the other, a fluttering bird acting as a 'helicopter' and being partially parachuted to the ground by the weight borne. In this crisis release was inevitable and the serpent fell precipitately to the ground some thirty feet. Except for the injuries sustained and presumably much the wiser for the experience the snake made off in haste and disappeared into a hole in the garden wall. The tired birds desisted from any further attacks. The screeches subsided to a cackle of satisfaction. The parrots commenced preening themselves. A hush then descended upon the world: a silence, which gave to the parrots a partial victory and fortuitously enough to the wounded snake its unexpected freedom.

Some important facts of biological significance very clearly emerge from this incident. Except for the singular diversion from the concerted and patterned form of attack, effected by one of the birds, all the participants in the general plan of aggression appeared to be completely without fear. All of them manifested equally an obsessional rage of intense degree. The equal enmity borne by all towards the snake precluded singling out any one pair as being more intensely concerned to guard and protect the interest of any possible fledglings, or eggs in a nest in the tree. Sálim Ali in his 'Book of Indian Birds' (page 92 records that the nesting season over the greater part of its range is between April and May. He states that 'when the nest is threatened, the owners summon assistance and the neighbourhood is soon seething with a noisy rabble of parakeets intent on shouting aggression down—if nothing else!' In the case in point, and so far as the cacophony alone is concerned, the behaviour of all the birds correspond to the description given by Sálim Ali. Since the nesting season is from April to May, the possibility of a nest, eggs, or fledglings can be ruled out.

The next important feature is referable to the sudden change in the tactics of attack on the part of one of the birds. Can it be said, that physical exhaustion caused this bird to devise the new method of aggression? It is obvious that the display of cunning exhibited by the change cannot be solely attributed to physical stress, since there is about the act a reasoned process. By that performance the snake was gotten rid off. That bird alone exercised initiative and was able and showed physical prowess enough to drag away the enemy from the tree's hollow. This action does show that parakeets can at times and in a crisis of the kind described resort—perhaps in a limited way—to a process of reasoning. It is well known that these birds, apart from the faculty they possess for imitating and reproducing any sound even that of articulated speech, can be trained to carry out many acts of different kinds and as Sálim Ali notes 'to perform tricks such as firing off a toy cannon'.

If the snake had been a cobra and the parakeets in their attack behaved in the reckless manner they did with the rat-snake, the consequences to the birds can, at a guess, be assessed at possibly a cent per cent mortality. In the evolutionary scale, the defensive provision in the cobra is of a quality which these foolhardy birds could never have circumvented, unless the cobra had been a young specimen with small operative fangs. In young cobras the biting apparatus is of course perfect. But the effectiveness of a bite is greatly reduced by feather or fur covering in the victim, or in the case of a man by a loosely falling pair of cotton or woollen slacks. Colonel Lamb, I.M.S., more than half a century ago arrived at the conviction, that thirty per cent of cobra bitten victims escape, because of sublethal doses of venom having been injected. Here then a biological issue arises. Are parakeets instinctively capable of discriminating between the poisonous and non-poisonous species of snakes? There is indirect evidence that they are, without the finality of proof, because of the part played by their other avian supporters, the mynas, who it should be noted, sounded alarm calls without participation in the affray. This difference in the attitude of the two species of birds demonstrates the inherent psychological and temperamental courage and apartness of the parakeets. It has yet to be proved whether the behaviour of parakeets is subject to a fear complex when faced with a hissing and venomous cobra.

As regards the behaviour of the snake the absence of any attempt to defend itself is noteworthy. But apart from the aspect of fear evinced, the fact that it had attained a height of about forty feet on that tree is evidence of its scansorial powers. The rat-snake is terrestrial more than arboreal. The case in point suggests the evolutionary tendency in this species toward an arboreal habit due possibly to the difficulty of finding food in areas when there is seasonal scarcity.

21, Napier Rd.,
Poona,
20*th January*, 1948.

A. G. L. FRASER,
Capt. I.M.D. (Retired).

33.—A KING-COBRA'S SPEED

In 1933, while trekking along the Sajek Valley, on my way to the Lushai villages, I was walking down a very narrow hill-track. This was a game-track, as there was no human habitation within fifteen or sixteen miles, and all this area was dense jungle, at the foot of the Lushai Hills, the home of elephants, tiger, bison (as vast areas were covered with bamboo, and the valley itself had *sunn* grass) and snakes of all varieties. I had met king cobras here in previous years and had found that they were just as easily killed with a stout walking cane, as any other snake, and it spoilt the skin if one used a gun. Zig-zagging down a hill-side, I looked over the side to see the river-bed about a thousand feet below, when I found a fair-sized hamadryad coming up the same path, just below me. We were bound to meet, and the hill made it impossible for either to avoid the other. I managed to scramble five or six feet up the side of the cliff, and clung on like a spider, and waited for him to appear. I had my cane climbing stick and my ·32 calibre revolver, and with shorts and shirt and rubber shoes was well equiped for a fast sprint. In a minute or two the snake appeared, winding along leisurely, with his skin shining in the morning sun (probably he had lately cast his skin and was going to hole up, as this was the beginning of October). He did not notice me 'frozen' to the cliff, and after he had passed me completely, I stepped down on the path and switched his tail with my cane lightly to annoy him, and ran down the path fairly fast but not at my best speed. I saw him erect his head and turn, as I ran, and it very nearly panicked me into running hard and off the cliff side and into the river-bed below! About thirty yards further down, as the path turned, I saw he had not gained on me, and about another forty yards on, the path widened enough for me to use my cane with effect, allowing me space to move and manoeuvre myself. I stopped here and watched him come on. He came right on, and about nine or ten feet away he stopped and put up his hood. He must have come up as high as my chest (I stand about five feet seven inches) as he did this a hard cut with my rather heavy cane, broke his neck, and he was soon put out of pain. My experience appeared to show that the King Cobra is hardly faster than the average good-sized rat snake. I doubt very much whether an average man going all out would have any great difficulty, panic apart, in getting away from any snake, even a King Cobra, which is believed to be the fastest snake in India. Perhaps other members might be able to shed further light on this.

62, Syed Amir Ali Avenue,
Ballygunge, Calcutta, S. K. GHOSH
1st *March*, 1948.

34.—MIRROR CARP

With reference to the introduction of the Mirror Carp (*Cyprinus carpio* var. *specularis*) by the Madras Fisheries Department into suitable freshwater lakes and tanks of India—*Journal* Vol. 45, p. 244—it is interesting to read in 'The Field' newspaper of 8th November 1947 an account by 'BB' of successful angling for Mirror Carp in an acre size weedly pond of Hertfordshire, England. There was previous ground-baiting, and the after-dark or very early morning fishing was by a crust of bread as bait after the fish had been attracted to the surface by crusts thrown in at the selected place. The average size of fish taken was 9 lbs. but there were larger specimens than that, may be up to 25 lbs. or more. On account of the heavy weed, strong tackle and drastic methods were necessary.

Owing to the failure of the monsoon the bed of the Ulsoor Lake at Bangalore was almost entirely dry during the first six months of 1947 and there was a great opportunity to have the floor levelled by bulldozers then available, and the mud and small puddles of remaining water removed. Had this been done the aestivating murrel and any other predaceous species would have been eliminated—a first requisite to successful stocking of lakes etc., with assured results to the introduced species. The opportunity was lost and may not recur for very many years.

Fingerlings of Mirror Carp also *cutla* (*Cutla buchanani*) were introduced into the lake on 16th October 1946 and as wolves and sheep in the same fold are not good 'mixers' it is likely that the murrel much appreciated the fare provided and attained aldermanic proportions. At present the lake has a dense blanket of weed over most of its surface so it is not known what success has been attained.

In August 1947 a consignment of Mirror Carp fingerlings was flown to the Kumaun lakes in Naini Tal district. Those deep lakes are never dry so the fish have to take their chance. The large trout of the Seven Lakes will doubtless have gained in bulk, but the acclimatization is likely to succeed.

BANGALORE, R. W. BURTON,
3rd January, 1948. *Lieut.-Colonel, Indian Army* (Retd.).

35.—OUTSIZE WHALE-SHARK IN BOMBAY WATERS

Whale-sharks are a rarity in our waters as is evident from the fact that but ten specimens were landed on the west coast of India between 1900 and 1941, the authority for the record being Prater (1941)[1]. Interest attaches, therefore, to the landing of a whale-shark of almost leviathan proportions at Navapur (Ucheli), a fishing village about 65 miles north of Bombay.

Fishermen from this village were out fishing about 15 miles away from the shore on February 21, 1948, when the shark got entangled in their nets. The fishermen battled with the monster for several hours before it was overpowered. It was then hauled ashore by two fishing boats late that evening.

The shark was a female *Rhineodon typus* Smith and measured 22 ft. 9 in. in total length. The upper lobe of the caudal fin alone was six feet long, while the spade-shaped mouth was three feet wide. The lateral aspect of the body and the tail bore three characteristic keels, while the body was marked by the usual spotted colouration.

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[1] Prater, S. H., 'The Whale-Shark (*Rhineodon typus* Smith) in Indian coastal waters', *J.B.N.H.S.*, 42, No. 2, 1941.

The 22 ft. 9 in. size of the whale-shark is a record for our province and is second only to that of the gigantic specimen of 29 feet landed on the coast of Travancore nearly half a century ago. The specimen landed at Navapur appears to be the first recorded occurrence of a female *Rhineodon typus* on our coast.

Expectations of copious yield of oil from the liver of the monster were belied, for when the body was slit open the liver was found to be of rather diminutive proportions to the size of the carcass. The liver yielded about 20 gallons of neat oil of pale yellow colour, almost deficient in Vitamin A content. It is a well recognised fact that *Rhineodon typus* is poor both in respect of oil content of its liver as well as its vitamin potency. Yield of oil from the liver of a common shark of like size would easily have been 50 gallons worth about Rs. 1,000.

The landing of a whale-shark on our coast in February lends additional support to Prater's inference (op. cit.) that the visits of these monsters to the coastal waters of India between January and April are attributable to the abundance of zooplankton in these waters during this period.

BOMBAY, C. V. KULKARNI,
28th March, 1948 *Superintendent of Fisheries (Inland).*

36.—UTILISATION OF FIRE SERVICE TANKS FOR FISH REARING[1]

Several concrete static tanks have been recently constructed in our cities and towns for fire-fighting purposes. In the Madras Province, these tanks are being used for storing and distributing fish-seed, for maintaining stocks of larvicides, and for fish production and marketing.

The following are the details of the working of a static tank attached to the Government House Fish Farm in Madras City. The tank is concrete-built with a capacity of 150,000 gallons. The depth of waters varies from 3 to 10 feet. In July and August 1946, it was stocked with 75 fry of *Labeo rohita*, 3,500 *Catla catla*, 10 *Gourami*, 100 *Etroplus suratensis* and 500 *Gambusia affinis*. Earthen pots containing live clusters of lotus and *Vallisneria* were submerged in the tank. Clumps of weeds such as Hydrilla and Chara were introduced; and four manure baskets were also suspended in the tank. The water was greenish yellow in colour and contained the following planktonic organisms: *Anabaenopsis*, *Aphanocapsa*, *Ceratoceros*, *Closterium*, *Cyclops*, *Cyclotella*, *Cypridopsis*, *Diaptomus*, *Daphnia*, *Euglena*, *Lyngbia*, *Melosira*, *Microcystis*, *Nauplius* larvae, *Navicula*, *Oscillatoria*, *Pandorina*, *Paramoecium*, *Phacus*, Rotifers, *Spirogyra*, *Spirulina*, *Synedra*, *Suriella*, *Volvox* and Vorticellids.

By the end of November 1946, the Catla fry attained a size of 10 inches; and 3,000 of them were therefore removed for stocking other waters. In January 1947, 20 *Labeo rohita*, measuring 12 to 15 inches in length, were removed for stocking another tank. In June 1947, another lot of 34 Rohu, 14 to 18 inches in length and 2 to 3 lbs. in weight, were netted and marketed. Other fishes such as Gourami and *Etroplus*, which had grown to 12 and 6 inches respectively, were removed to another breeding pond. In July 1947 the tank was emptied with the assistance of the Fire Service personnel to remove the accumulation of decomposed leaves and debris which had fallen in from the adjoining trees. After cleaning and drying for a week, the tank was refilled and stocked with a fresh consignment of fish fry. During the process of cleaning, a freshwater turtle (*Geoemyda trijuga*) and a female eel (*Anguilla bengalensis*—36 inches and 3 lbs.) were found in the tank. Examination of the stomach-contents of the eel revealed the presence of fish-remains and algal matter. As the tank has concrete wall 4 feet high all round, it is not known how these fish enemies entered it. It is clear that the innumerable static tanks could with little attention be utilised for fish rearing in collaboration with the staff of the Fire Service Department.

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[1] Communicated with the permission of the Director of Industries and Commerce, Madras.

8, Ormes Road,
Kilpauk, Madras. P. I. CHACKO

37.—FISH PRODUCTION IN RELIGIOUS INSTITUTIONAL WATERS[1]

The large number of ponds and tanks under the control of religious institutions like temples and mosques are unexploited for fish production in view of religious restrictions. These waters could serve as excellent fish sanctuaries since the fish population would be protected and allowed to grow and breed freely. It was Thomas (1870) who first suggested the utilisation of religious institutional waters for breeding of Gourami and other species. Under the Grow More Food campaign, the Madras Fisheries were able to persuade the authorities to allow pisciculture in their tanks with due consideration to the prevailing religious sentiments. And many of the trustees have since taken to fish-rearing and marketing for themselves, besides placing certain waters at the disposal of the department for demonstration purposes. Others have permitted fish-breeding only for removal of the offsprings for redistribution to other waters. Thus the religious institutional waters serve as breeding and nursery areas and also as fish production centres.

The ecological conditions of these waters are favourable for fish-life. The optimum conditions such as heat, light and nutrient substances and algal growth are found in these waters (Ganapati, 1940). The macrovegetation usually occurring in them are:

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[1] Communicated with the permission of the Director of Industries and Commerce, Madras.

Nymphaea lotus, N.rubra, N.stellata, Nelumbium speciosum, Jussiaea repens, Ipomœa aquatica, Ceratophyllum demersum, Hydrilla verticillata, Vallisneria spiralis, Ottelia alismoides, Eichornia speciosa, Typha elephantina, Pistia stratiotes, Lemna polyrrhiza, Potomogeton pectinlatus, Najas indica and *N.minor*.

The following organisms are usually met with in these waters: *Amphora, Anabaena, Aphanocapsa, Caridina sp, Chaetoceros, Closterium, Copepods, Corixa, Coscinodiscus, Cosmarium, Cyclops, Cyclotella, Daphnids*, Dipteran larvae, Ephemerid larvae, *Eudorina, Eunotia, Eudorina, Euglena*, fish egga and larvae, *Fragilaria, Gloecapsa, Gyrosigma, Halosphaera, Heliozoa, Lyngbia, Mastogloia, Melosira, Micronecta, Microcystis, Nauplius* larvae, *Navicula, Nitzschia, Notonecta, Oedogonium, Oscillatoria, Pandorina, Pediastrum, Phacus, Pithophora, Pleurosigma, Spirogyra, Spirulina, Staurastrum, Suriella, Synedra*, Rotifers (*Hydatina* and *Philodina*), veliger larvae and *Volvox*.

Details of growth in the first year of some of the species recently grown in these waters are as follows:—

Name of fish	Size in inches, attained in the first year.	Weight in lbs.	Location of the religious water.
Catla catla	27	7	Madura.
Osphronemus goramy	10	1½	Coimbatore.
Chanos chanos	25	2	Rameswaram.
Barbus hexagonolepis	7	¼	Coimbatore.
Etroplus suratensis	9	¼	Chittoor.

Gourami and *Etroplus* have bred in the religious waters in Calicut, Coimbatore, Coondapur, Karkal, Madras and Tenkasi. These waters have thus formed valuable seed sources. Catla has grown to 3 feet and 35 pounds in three years in the Sri Meenakshi temple tank in Madura. In the Sri Gangadheswarar temple tank, Madras, about 1 acre in area, about 500 pounds of fish were harvested within a period of 10 months in 1947.

Apart from fish-food production, rearing of fishes in these waters is useful from the point of view of public health. Many of these waters are breeding places of mosquitoes, and many emit a foul odour, especially when having a bloom of the blue-green alga, *Microcystis* (Ganapati, 1940). Rearing of fishes reduces both mosquito larval incidence and microcystis bloom, and thus makes the waters cleaner. It is observed that the carp-minnow, *Rasbora daniconius* (Hamilton) is the best suited species for reducing water blooms.

It is of interest to note here that certain sections of the river are protected from fishing by the priests of the temples nearby. Thus the Mahseer and other large carps find a peaceful sanctuary in river stretches near Todikana, Cicily and Bantwal in South Kanara district, and near Courtallam and Papanasam in Tinnevelly district. The fish in these areas are considered sacred and are fed by the priests and worshippers. These fishes thus breed and give rise to the annual fisheries in other sections of the rivers.

8, ORMES ROAD, P. I. CHACKO.
KILPAUK, MADRAS.

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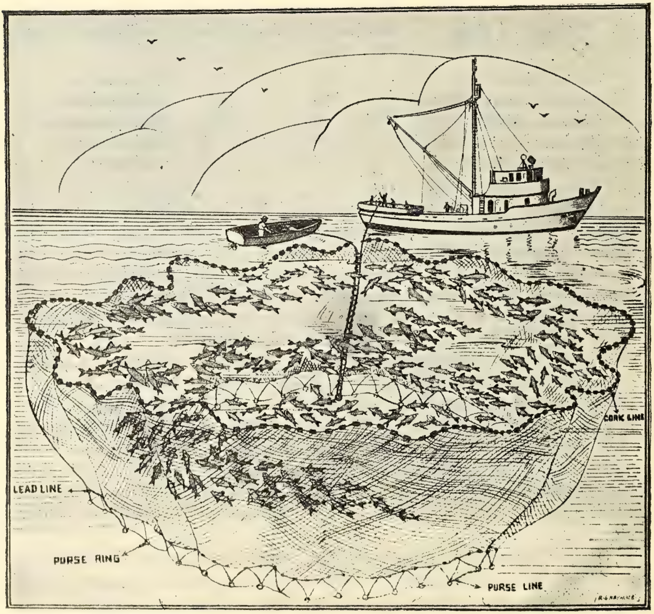
38.—PURSE-SEINER OPERATING IN BOMBAY:

NEW EXPERIMENT TO CATCH FISH

(*With a text figure*)

Amid the thousands of vessels that dot Bombay's harbour is one that stands out distinctively. Brought out specially from



An artist's impression of what the purse-seine looks like when a shoal of fish is encircled and the purse-line passing through the rings along the bottom edge of the net is being pursed as the operation is technically known. In this operation the purse-line is pulled in by the winch on the parent vessel.

America, the vessel is technically known as Purse-Seiner, the prototype of which was used first in 1826 by three Rhode Island fishermen to catch fish that moved in big shoals. Their net, a purse-seine, from which the vessel takes its name was 65 fathoms long and 284 meshes deep and was used from a rowing boat. Both the net and the vessel have undergone vast transformation in the 120 years that have elapsed since the pioneer enterprise of the three Rhode Islanders.

The purse-seiner now operating in Bombay incorporates all the most up-to-date features of such vessels, which are extensively used off the Pacific coast of the U.S.A. She carries one net which alone costs Rs. 60,000. Its most distinguishing feature is its versatility as it is capable of being used for almost every type of the more important commercial marine fisheries.

Outstanding Features

The vessel is noteworthy for the location of the deck-house, which is set well forward. A single mast, carrying the heavy boom, rises at the after end of the deck-house, while a purse winch is set up on the deck between the mast and the hatch opening. Occupying the entire after-quarter of the boat is the turn-table which is perhaps the outstanding single characteristic of the purse-seiner.

Apart from fishing, purse-seiners proved invaluable during the last war, when it was found that they could be quickly and economically adpated to naval uses. They were employed to patrol the coast of the U.S.A. and were also employed on mine-sweeping work. Viewed through the eyes of the Navy, their hull arrangement was found to be ideal. The clearing aft-deck permits of easy handling of the gear for sweeping mines. The mast and derricks fitted to handle fish can just as easily handle mine-sweeping gear, while the crow's nest at the masthead, where the look-out is posted to watch for fish, serves just as readily as a look-out position for mines, or to report the approach of enemy vessels and aircraft. On the deck are situated the wheel-house, look-out, bridge, gully and crew's quarters, while below the deck are the engine-room, fuel, lubricating oil and water tanks, chain lockers and miscellaneous storage space.

Device to detect Fish

Fishing in our waters is now done in a primitive manner, the fishermen going out to sea and casting their nets heedless whether fish are there or not. The fishermen just wait on the blind chance for fish to get entangled in the nets. These methods of fishing will be completely revolutionised by one of the instruments the purse-seiner carries. This instrument, a Fathometer, is a device akin in some respects to submarine detecting apparatus or radar. It enables the skipper to track fish almost down to their lair, for shoals appear as shades on the screen of the Fathometer. All the present indiscriminate waste of energy and effort in catching fish will be eliminated, as the crew will pave out the purse-seine only when and where the presence of schools of fish is indicated.

Wireless Telephone

The vessel is also equipped with a wireless telephone which will enable it to keep in constant touch with the office of its owners in Bombay. This office has a receiving set and will be able to know the exact location of the vessel at any moment.

The purse-seine itself consists of a long stretch of tarred cotton webbing hung between a cork line and a lead line. Cork floats are strung on the cork line to support the net in water, while the lead line is weighted so that the net hangs vertically. From the lead line hang rings along the entire lower edge of the net, a heavy line running through the rings.

Some idea of the size and power of the vessel is furnished by the fact that not only has it come to India under its own power all the way from America but also that it carries another small power vessel which is used exclusively as a pivot to hold one end of the net while the parent ship encircles the shoal. This small vessel or skiff is carried by every purse-seiner on the top of the net on its turn-table. When a school of fish is sighted this skiff is dropped overboard from the stern of the purse-seiner which runs ahead while the men in the skiff move in the opposite direction, with the result that the net is drawn off the turn-table into the water as the vessel encircles the school. The two boats complete the circle.

The winch on the deck to which the purse-line is attached then starts working. As the line is drawn the lower end of the net closes completely in the form of a purse surrounding the fish. The transfer of the fish from the net to the boat is accomplished by brailing which consists of plunging a huge dip net into the seine net, raising it by power and moving it over the hatch through which the fish are discharged into the hold.

The vessel, which has been brought out for experimental purposes by one of the numerous new concerns in the fish trade with the active encouragement of the Government of India, at a cost of over Rs. 5,50,000, has a length of 82 feet, while its breadth is 19 feet. It is equipped with a high-powered diesel engine and has comfortable living accommodation for a crew of 14, the number of Americans and Cubans who have brought it out to India. The ship is equipped with refrigeration plant, the cold storage capacity being 60 tons.

The value of many more such vessels being introduced in the fish trade is obvious, specially in view of our adverse climatic conditions and the comparatively great distance from Bombay at which shoaling fish occur. The refrigerating facilities are, for this reason, a special boon. Apart from the value of such vessels to the fish trade, their importance from the naval aspect cannot be overlooked.

BOMBAY, S. B. SETNA, PH. D.
April, 1948. *Director of Fisheries*

39.—THE BIOLOGY OF *DANAUS CHRYSIPPUS* L.

I have been rearing this species in very considerable numbers during the last few years in the course of experiments designed to determine whether the pupating larvae showed any colour preference in the selection of their pupating sites and whether there was any relation between the colour of the pupa and its surroundings. There are, therefore, a few additions that I would like to make to Messrs. Mukerji and Behura's very comprehensive paper under this title in this journal (Vol. 47. 111:1947).

The experiments were comparatively simple: a lidless box, some eight inches long by six wide by two deep, was fixed with the open side against a well lighted window that escaped direct sunshine. The top of the box was fitted with a cardboard strip eight inches long by two wide enamelled in inch wide stripes of various colours and a similar strip was fitted to the back of the box, continuing the colours down the back for two inches. Eight colours were used—pink, red, brown, black, green, blue, white and cream—and a series of strips were prepared so that all possible sequences of colour were employed. As soon as a larva started its prepupational wandering, it was placed in this apparatus and a note was kept of the colour of the stripe from which it suspended itself and the colour of the resulting pupa. These records have, unfortunately, been mislaid so that I can give no actual figures, but the experiments, in which several hundred larvae were used, showed that there was no colour preference in the selection of the pupating site but that there was a very decided preference for a site towards the angle formed by the top and side of the box, very many more pupae being suspended from the two outermost stripes at each end, irrespective of their colour, than from the four middle stripes of each enamelled strip. I could trace no relationship between the colour of the pupa and its surroundings.

As regards my record of the food-plant of this species as *Calotropis procera*, it is quite possible that, so far as Calcutta is concerned, this is incorrect. The food-plant was identified for me in 1925 in the Punjab and, being no botanist, the Calcutta food-plant appeared to me to be the same species. On the evidence now brought forward it seems likely that the food-plant in Calcutta is *C. gigantea*, although *C. procera* is undoubtedly a food-plant where it occurs.

The ovum is usually laid singly on a leaf of the food-plant, more often on the lower than the upper surface, but there is no exposed portion of the plant that does not carry its quota of ova. I have found them on the flower-buds, flowers and unripe fruits, as well as on their stalks, and also on the main stem, both green and brown. I have even found ova on the leaves of a hibiscus that was growing intermingled with a plant of *Calotropis*.

In Calcutta the species is continuously brooded, but it is probably at its peak at the end of the cold and early in the hot weather.

The non-recording of the fact that the larva will feed on the flowers is, surely, due to this being in no way remarkable. There are few, if any, leaf-feeding larvae which will not also feed on the flowers of their food-plant, although the converse is not always true, many flower-feeding larvae will not eat, or at any rate not thrive on, leaves. The difference in the colour of the frass is, of course, due to the absence of chlorophyll from the flowers; this chlorophyll producing the green colour of the frass from leaf-feeding larvae.

I have not noticed any difference in colour between leaf—and flower-feeding larvae, but there is a very pronounced difference between most wild larvae and those reared in captivity. In wild larvae the transverse black lines are usually very fine, but in cage-reared examples they are much broader and, in extreme examples, the lines bounding the subdorsal yellow spots may widen so much that they meet, forming a solid black band enclosing the yellow spots. This increase in the width of the black lines appears to be due to lack of light. (Sevastopulo, 1945, *Entomologist*, 78: 117).

Before leaving the larva, it may be interesting to record here that I have one very extraordinary teratological aberration. This has, in addition to the usual tentaculae on the 2nd, 5th and 11th somites, extra tentaculae on the left side only on the 3rd, 6th, 7th, 8th, 9th, 10th and 12th somites. The right side shows no trace of any additional tentacula. I have bred this species in hundreds, as well as *Danaus limniace* Cr. and *Euploea core* Cr., but I have never seen another larva like this. (Sevastopulo, 1946, *Entomologist*, 79: 90).

As regards the colour of the pupa, surely it should be termed polychroic, since no fewer than five colour forms are enumerated. I myself have never bred anything but green and pinks forms in my mass rearing and I have not noticed any separation into a dark and pale shade in normal, full-sized pupae. I have, however, noticed that undersized pupae, presumably from underfed larvae, are often paler in colour than full-sized ones. It is worth mentioning that the colour of the pupa can usually be detected an hour or so before the final moult takes place, and also that the yellow spots of the larva are present on the newly formed pupa, gradually disappearing as the pupa hardens. So far as I can make out, the colour of the pupa is not due to environmental factors and is probably genetic.

So far as I know, there are no records of any dipteron parasitising a lepidopterous host in the egg stage, nor do I think it possible that a newly hatched lepidopterous larva could swallow the parasite's ovum undamaged along with its own egg-shell, its jaws would be far too minute. That certain tachinids infest their hosts by laying their eggs on the food-plant and their subsequent swallowing, is, of course, well known, but strangely enough I have never reared a tachinid from any *chrysippus* larva or pupa that I have reared *ab ovo*, although I have had them in numbers when half grown larvae were collected and reared. The trichogrammid egg parasite is often very common and must be one of the chief controlling factors for the species. The other hymenopterous parasite that I bred pupated inside the host pupa and emerged through a hole gnawed in the centre of the wing case. It seems to be more common outside Calcutta.

Turning to the imago, I have never found either f. *alcippus* Cr. or *dorippus* Klug in Calcutta, but a fair proportion of Calcutta specimens have a few white scales along the veins on the disc of the hind wings, and a small percentage have a more or less pronounced tawny suffusion in the black of the apex of the forewing. There is also an unnamed variety which has the black of the thorax replaced by very dark coffee brown. I have bred one example of ab. *amplifascia* Talbot from a Calcutta larva, in this form the white sub-apical spots are extended inwards to the discocellular vein. Ab. *bowringi* Moore, with an extra white submarginal spot in interspace 2, is not uncommon.

I can also record a few more instances where this species has been accepted or refused by birds and lizards. All these records were originally published elsewhere.

A gecko, species unknown, seized a larva without hesitation but threw it away immediately and refused a second one. (Sevastopulo, 1942, *Entomologist*, 75: 206).

A tame Racket-tailed Drongo (*Dissemurus paradiseus*) picked up and pecked at a full-grown larva but dropped it immediately and did everything possible to remove the juice from its beak. The same bird ate a pupa and also an imago. (Sevastopulo, 1942, *Entomologist*, 75: 231). The same bird swallowed and then regurgitated a pupa of the species and ignored a second one. (Sevastopulo, 1943, *Entomologist*, 76: 148).

A tame Red-whiskered Bulbul (*Otocompsa jocosa*) took a half inch long larva after some hesitation and then dropped it. A second larva was refused. (Sevastopulo, 1946, *Entomologist*, 79: 95).

London,
8th November, 1948. D. G. SEVASTOPULO, F.R.E.S.

40.—A HONEY-BEE IN THE NEST OF A MASON-WASP.

I should much appreciate it if you would be kind enough to tell me something about the habits of the mason wasp. Hitherto I have been rather vague as to whether there might be more than one species. Until I left Khandala a few days ago, I had believed there were but two which built the clay nests and which most people are familiar with—the one slightly larger wasp, with maroon and yellow bands around its abdomen and which inserted a grub or caterpillar after completing the building; the other smaller of a steel-blue colour and which I had observed carrying insects but whose nests I had never bothered to differentiate from the former's. That both would readily sting if interfered with I had had good reason to remember. But that the occupant of any such nest might be a living honey bee, surprised me recently—and rather painfully.

It was while unrolling my tent that I discovered half-a-dozen of these clay nests in a group on the canvas, and about an inch in length and approximately the shape and thickness of a cigarette. I detached some of them by a sweep of my hand;

nearly all thus broke open or were damaged. A few remained adherent to the canvas and in picking up one of these, with an open end, I received a sting on the finger. On opening the nest I found a single and perfectly healthy honey-bee. The contents of the other nests were a few living small spiders and fragments or skeletons of more, but not a single grub or caterpillar. I assumed that these nests had been built by the smaller, steel-blue wasp simply because I had observed one in my bedroom during the previous couple of days and had seen it dragging a dead cricket across my dressing table. The only honey-bees I am familiar with are the very small in size, the medium and the large (the latter known in some parts of India as the 'bora' bee and fully an inch in length). The one I found in one of these clay nests and which stung me was of the medium size. That nest contained nothing besides this living bee. Whether one end of the nest had always been open I cannot say, for I supposed I had damaged it at the time. I have since been wondering whether the wasp had captured this bee (larger than itself) and sealed it within the nest, or whether the bee had found it open and empty and, for reasons of its own, entered and remained in it. The tent (80 lb., double fly) had been loosely rolled up when leaving the jungle in the middle of February and I had not taken it out on my subsequent trips thither, so I have no idea as to when those clay nests were being built—the outside of the folded and rolled-up tent had been flitted with 5% D.D.T. on each occasion that I returned to Khandala.

'HIAWATHA'
LOVEDALE,
NILGIRIS,
10*th April*, 1948.

K. BOSWELL,
Capt.

Asked to comment on the above, Lt.-Col. R. W. G. Hingston, author of the excellent contributions on Mason and Potter Wasps (vols. xxxi & xxxii) and several other memorable papers in the *Journal*, wrote: 'It is now so long—well over 20 years—since I have had an opportunity of observing mason wasps that I feel too rusty on the subject to send you anything for publication in the *Journal*. But the following points come to my mind on reading Capt. Boswell's letter, and you may care to pass them on to him.

There are far more than one species of mason wasp. Possibly there are more than 100 species in India alone. The one he refers to with maroon and yellow abdominal bands is probably *Eumenes*. The steely blue one is probably *Rhynchium*. The clay nests, shaped like a cigarette and stored with spiders, which he found in the folds of his tent, may have been made by a species of *Sceliphron*. That one of these cells should have contained a healthy honey-bee is an occurrence I cannot explain. No mason wasp, so far as I am aware, stores or attracts honey-bees; and a mud nest is not a place where one would expect a honey-bee to go of its own accord. I wonder could there be any mistake in identification? Some mason wasps—such as *Rhynchium*—have the habit of resting in their cells, and will sting if they are interfered with; and there are some which might be said to have a faint resemblance to a honey-bee. If Capt. Boswell picked one of these out of its cell, it would sting him, and he might in the confusion mistake it for a honey-bee. This may not seem a likely explanation; and there may well be a better one; but it is the only one I can offer, for if there has been no mistake in identification, then the event is to me a mystery.'

Col. Hingston's comments were passed on to Capt. Boswell, and here is what he says: 'As to the possibility of my having been mistaken in the identification of that which stung me being a honey-bee: This point is interesting to me; for, even without a full knowledge of the habits of mason wasps, it would surprise me to learn that a honey-bee had been actually captured by a mason wasp for storing in its nest. Of course, at the time in question, and by associating the spider contents of the other nests with the presence of this bee alone in a similar one amongst them, I had assumed that it had been similarly captured and for the same purpose. But, if I did not mention it before, I would like to add now that this nest, from which I received a sting, was open at one end. As it had remained intact and adherent to the tent after I had brushed off, or thus partly destroyed, the other nests, I made to pluck it off by seizing it at either end between finger and thumb and then was stung from the open end. Snatching away my hand, I saw the end of the abdomen of this "bee" protruding from the opening—moving concertina-wise—in the manner of such insects during respiration. This open end must suggest that the inmate was not a captive; or, if a captive, that the wasp had not sealed that end for some reason. But whether the prey had been partially incapacitated by a sting from the wasp, I could not have judged then; for, in destroying the containing nest, my servant had also struck at the exposed occupant with his hand as it struggled in the debris. This blow did not kill it and it began to walk confusedly about the canvas. So, it had retained at least its powers of locomotion. To me—as well as to my servant—it was a honey-bee; and, until I am shown a wasp with a similar resemblance to it, I am obliged to repeat my belief that this was a honey-bee. However, in the light of Col. Hingston's experienced observations on the matter, the presence of a living bee in an open wasp's nest seems to be an interesting mystery at present.'—Eds.

41.—ON A VARIETY OF *ACANTHOLEPIS FRAUENFELDI* MAYR. (FORMICIDAE) NEW TO INDIA.

Not less than fifteen varieties and a number of sub-species of the ant *Acantholepis frauenfeldi* Mayr. have so far been recorded throughout the world besides three varieties from India.

The new variety of *A. frauenfeldi* collected by us was found attending on the common yellow plant-lice *Aphis nerii* (Fonsc.) on the common *Calotropis giganta* Br., (Bengali: *Akanda*) in our college garden at Ballygunge, Calcutta and near about its locality in the months of September, 1945 to December, 1945.

This new variety of ant differs from that of the species *A. frauenfeldi* in the maximum limit of size. The former is 3 to 4 mm. (av. 3.315 mm.) whereas the latter's maximum length recorded is 3 mm. The general colour is piceous-brown. The pronotum is constricted behind. The tooth of the mesonotum is more distinct. The legs and antennae are yellowish brown. Pubescence is fair on the head and abdomen.

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42.—REMARKS ON APHIDS ON *NERIUM ODORUM* SOL. AND *CALOTROPIS GIGANTEA* BR.

The European and American forms of the aphid *Aphis nerii* (Fonsc.) are known to infest plants belonging to the natural orders Apocynaceae and Asclepiadaceae. In India, it is reported that this species is restricted only to Asclepiads. In this note, we record for the first time that this species in India occurs on the plant *Nerium odorum* Sol., popularly called the Oleander and belonging to the natural order Apocynaceae. It is remarkable to note that the species of aphid occurring on the Apocynaceae is regarded by Theobald (1915) as different from the one occurring on Asclepiadaceae. But Das and van der Goot (1918) and Swain (1919) from California were of the opinion that these two species of *Aphis* are one and the same though occurring on the host-plants of two different natural orders. We find in Calcutta that the aphid occurring on the Asclepiad *Calotropis gigantea* Br. closely resembles the species on Oleander of the natural order Apocynaceae. But there is a remarkable difference between them with regard to the number and distribution of the secondary sensoria on the III antennal segment. In the species *A. nerii* occurring on the Asclepiad *C. gigantea*, the number of sensoria varies from 9 to 12 in the alate viviparous parthenogenetic females, whereas in the species similar to *A. nerii* but occurring on Oleander, the sensoria number varies from 6 to 7 in the alate viviparous parthenogenetic forms. The authors substantiate the views of Theobald that they are two species and propose that the name *Aphis asclepiadis* of Passerni be retained for the one inhabiting the plant *Calotropis* and the other Asclepiads and *Aphis nerii* Fonsc., for the one found on Oleander, on the understanding that *Aphis nerii* of Fonscolombe is not synonymous with *Aphis asclepiadis* of Passerni though these two were shown to be one and the same by Das (1918) and put as synonyms by George (1927).[1]

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43.—THE GENUS *CEROPEGIA*—FURTHER COMMENTS

In a recent note published in the *Journal* (46: 742-3, 1947), the writer remarks: 'It is incumbent on every systematist to strictly follow the International Rules of Botanical Nomenclature while dealing with taxonomical problems.' May I bring out a few points in connection with McCann's altering *C. odorata* to *C. blatteri*. The writer of the note seems to imply that McCann has not followed the rules: it is mainly from a thorough study of such Rules that I have come to the conclusion that McCann is justified in creating a new name.

Graham's Catalogue, p. 118, no. 896 runs: '*C. odorata* N. Flowers yellow, fragrant; so unusual in the genus.' That is all the description given by Nimmo. Now, according to the Rules this short description was *effectively* published when it appeared in Graham's Catalogue in 1839. But Art. 37 states that 'a name of a taxonomic group is not *validly* published unless it is both (1) effectively published (see Art. 36), and (2) accompanied by a description of the group or by a reference to a previously and effectively published description of it'. Art. 44 further adds: 'The name of a species or of a subdivision of a species is not validly published unless it is accompanied (1) by a description of the group; or (2) by the citation of a previously and effectively published description of the group under another name; or (3) by a plate or figure with analyses showing essential characters; but this applies only to plates or figures published before January 1, 1908.'

C. odorata Nimmo was *effectively* published by its insertion in Graham's Catalogue, but none of the conditions for a *valid* publication were fulfilled; Nimmo's description is not sufficiently explicit for the identification of the plant and there are neither references nor plates accompanying Nimmo's scanty description. From my discussions with McCann himself before both of us left India, I know this to be the idea he had in his mind, although unfortunately the wording of his note in the *Journal* (45: 210-11, 1945) is somewhat vague.

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[1] This piece of research work was carried out in the Zoology Department of the Calcutta University when the junior author was a post-graduate student.

Nimmo's remark 'so unusual in the genus' may refer to the colour of the flowers, to their fragrance, or to both colour and fragrance taken together. As to the colour: there are actually *two* yellow *Ceropegia* spp. in the Konkan: one is the plant in question, the second is the unnamed plant mentioned by Nimmo after No. 898. The latter plant is the only common species of *Ceropegia* in Khandala; its flowers are *yellow*, except that when old and decaying they turn dingy white. McCann has named this plant *C. evansii.* As to the fragrance of the flowers: I have examined several species of *Ceropegia* in the field and found that they possess but the faintest traces of scent; fragrance in my opinion cannot be used for the identification of the Bombay Ceropegias. My conclusions are the same as McCann's, that is to say, that the plant named *C. odorata* by Nimmo cannot be identified with certainty either from its colour or its fragrance.

It is somewhat astonishing, then, that Hooker was able to identify his own plant as being the *C. odorata* of Nimmo; this could only be done from actual specimens identified by Nimmo himself. There are no specimens in the Hooker Herbarium preserved at Kew which have been identified by Nimmo. Strictly speaking, then, what Hooker actually did was to describe a new plant of his own, which he could have named as he pleased, but which he named *C. odorata* Nimmo on the *assumption* that both plants were identical. Hooker, however, has not proved such an identity.

The following are the steps by which McCann came to the conclusion that a new name was needed for Hooker's plant:

1. Nimmo's description is too vague, and cannot be accepted as sufficient for the identification of the plant.

2. Hooker assumed the identity of his plant with that of Nimmo, but had no means of proving the two plants were identical. In view of Nimmo's scanty description and in the absence of Nimmo's type specimens, the specific identity of the two plants cannot be determined with certainty.

3. Hooker's plant has been sufficiently described in Fl. Brit. Ind. 4: 75, 1883, and its inclusion in the Flora is enough for its valid publication.

4. Hooker's plant cannot be called *C. odorata* Nimmo, for the reasons just given; it cannot be called *C. odorata* Hooker, for the specific epithet is preoccupied by Nimmo's older one; this is according to Art. 61 of the Rules.

5. Hooker's plant, therefore, has to be given a new name, and this has been done by McCann.

6. McCann, however, should have written *Ceropegia Blatteri* McCann, *nom. nov.*; such a name is obviously not a new combination, but an entirely new name.

My own conclusions are the same as McCann's, or to put them more clearly, they may be summarized thus:

1. *Ceropegia odorata* Nimmo stands, but merely as the name of an *uncertain* species.
2. Hooker's plant cannot be called *C. odorata*.
3. McCann is perfectly justified in giving a new name to Hooker's plant.
4. The name and synonymy of Hooker's plant is as follows: *Ceropegia Blatteri* McCann, nom. nov. in *Journ., Bomb. Nat. Hist. Soc.* 45: 210-11, 1945. Syn.: *C. odorata* Hooker f., in Fl. Brit. Ind. 4: 75, 1883 (non *C. odorata* Nimmo, 1839, nomen dubium).

These conclusions are based on my interpretation of Art. 44 of the Intern. Rules of Bot. Nomencl. During a recent discussion with several of the Kew specialists on the *Ceropegia odorata* question, my interpretation of Art. 44 was accepted as correct.

THE HERBARIUM & LIBRARY,
ROYAL BOTANIC GARDENS,
KEW, SURREY, ENGLAND,
12*th January*, 1948.

H. SANTAPAU, S.J.

44.—CAVE FAUNA

I would like to correct an error in my note on Cave Fauna (*Journ., Bom. Nat. Hist. Soc.*, Vol. 46, No. 4, April 1947). On p. 590 I said that the large cave campodea from caves in the Simla Hills is *much* larger than the campodea of the Mammoth Caves of America.

This is a mistake due to the use of a wrong scale factor when taking measurements from an enlarged photograph. Re-measuring from a photograph taken at exactly natural size with a Leica 1/1 extension shows that it would be correct to say that this Indian campodea is at least as large as the huge cave campodea of America. My measurements make the length with antennae and cercopods about 8 mm. as against about 6½ mm. for *Campodea cookei* Packard.

The specimens which I obtained are undetermined, undescribed and destroyed. The insect awaits rediscovery. The most promising area is Baghat State in the Simla Hills and in particular the cave near the village of Kotla where it may be common. I saw three during a very brief search.

One specimen, possibly a different species, was found in a small mine above the Simla-Naldera road at 11 miles 5 furlongs from Simla.

No others were seen inspite of repeated visits.

STEEPWAYS,
CROSS OAK ROAD,
BERKHAMSTED, HERTS.

E. A. GLENNIE,
Brigadier

45.—'SHAMMING DEATH': SNAKES

In reference to Mr. Macdonald's note on this subject—Vol. 47, page 173—those interested may like to know that of the three snakes of Great Britain: the Grass Snake, the Smooth Snake, and the Adder (the last only being poisonous to man), the Grass Snake frequently shams dead, and in a very realistic manner as shown by a photograph published some years ago in the 'Field' newspaper.

LANGFORD GARDENS,
RICHMOND TOWN,
BANGALORE,
15*th March*, 1948.

R. W. BURTON,
Lt.-Col. I.A. (Retd.).

46.—'SHAMMING DEATH'

It is of interest to note that in the book 'African Notes and Reminiscences' by F. C. Selous (1908), it is recorded that a pack of 15 to 20 wild dogs (The Cape Hunting Dog—*Lycaon pictus*) were chased by the author and his companions on horseback accompanied by a number of large, powerful mongrels. The hounds mobbed and pulled down two of the wild dogs and Selous shot one other.

'As each of the two wild dogs which had been caught had been worried for some minutes by five or six assailants, we thought they were dead and beat off our dogs . . . . we dragged these two, together with the one I had shot, to a tree near a small stream where we intended to skin them.

We had just commenced to skin the wild dog I had shot when, on looking round, I caught the eye of one of the other two that was lying dead, as we thought, at the foot of the tree, and instantly saw it was alive. It must have been shamming dead all the time in order to recover its strength, as immediately it caught my eye it sprang to its feet and dashed off. Two shots were fired at it as it ran, but it got clean away apparently none the worse for the worrying it had endured.'

BANGALORE,
17*th May*, 1948.

R. W. BURTON.
Lt.-Col. I.A. (Retd.).

47.—WILD LIFE PRESERVATION: BIRDS

In the Madras Presidency, as far as I have been able to ascertain, there has been only one Local Government Notification under Section 3 of the Wild Birds and Animals Protection Act VIII of 1912, namely, Notification No. 574, published at pages 1564-1566 of Part I of *Fort St. George Gazette*, dated 3rd November 1914 as amended by Notifications No. 412 of 29th August 1916 and No. 295 of 25th June 1917.

Under the above Notifications specified species of Orioles and Woodpeckers are protected all the year round; the Indian Roller Grey and Red Jungle-Fowl and Red and Painted Spur-Fowl, also four species of Kingfisher, are provided with close season from 1st February to 30th June.

Peafowl, Bustard, Florican, and indigenous duck and teal have a close season from 1st June to 30th September.

Four species of Egret are protected from 1st June to end of February, and the Common Heron from the 1st December to end of February.

Of the species listed in the Schedule to Act VIII of 1912 the following are given no protection—no close season:—

Partridge, Pigeon, Quails, Sandgrouse.

The Notifications provide protection, etc., for certain birds in the Shevaroy Hills, and nothing in them affect the Nilgiri Hills.

It is difficult to understand why the Indian Roller and the bright-plumaged Kingfishers should be refused all the year round protection, also the Egrets.

The Indian Roller does great service to agriculture and should undoubtedly be wholly protected.

Egrets are birds of much use to the cultivator, the Cattle Egret in particular being especially useful to the cultivator of paddy (rice), as it is, '—chiefly, if not entirely, insectivorous in its diet and passes its life in the service of Man, clearing his fields of harmful insect pests and his cattle of their noxious parasites. Grasshoppers, locusts, bugs, beetles, ticks and blood-sucking and biting flies form their ordinary diet.' (W. W. A. Phillips in the Ceylon Fauna Society's '*Loris*' for June 1948.)

Throughout the world, where the species exists, the egret is renowned for its usefulness and should be protected throughout the year. In Ceylon, notwithstanding complete protection under the laws, great slaughter of fledgling egrets and destruction of their eggs takes place, so it is likely that similar destruction occurs in many parts of India also, especially in these days of meat hunger and shortage of food.

Partridges. In the Mysore State close season for partridge is 1st May to 1st September in spite of which the birds are netted in large number—20 dozen sold to hotel caterers on the 24th July 1948 in the Bangalore Civil Area Municipal Market. 27 dozen were similarly sold in the month of February 1948—the open season. If such sale can take place where there is a prescribed close season, what is likely to be the state of affairs in Madras Province where these birds are given no legal protection?

At the present time (breeding season), and for years past, partridge and quail are quoted in the Madras Municipal Corporation Moore Market price lists as available to purchasers at stated prices. It is probable that in parts of Madras Province within reach of large markets partridges are yearly becoming more and more scarce.

Thirty-five years ago the railway companies passed orders prohibiting acceptance of wild birds and game for rail transit during prescribed close seasons. In these days it is necessary that similar orders be issued as well to all bus owners.

Under the Mysore State laws Junglefowl, Spurfowl, Partridge, Sandgrouse, Quail, Pigeon, Bustard, Florican, Duck, Teal, Goose, Snipe, Demoiselle Crane, Plover, Golden Plover are provided with specified close seasons. *No birds other than those mentioned above except birds of prey may be shot.*

Omitting Bustard and Florican as having become increasingly scarce, and Demoiselle Crane, Plover, Golden Plover as better protected, while inserting Woodcock, Pheasants, Houbara and deleting the reference to birds of prey, that is a very simple and practical law understandable by all and a guide for adoption by all Provinces when the welcome day arrives for the whole urgent question of the Preservation of Wild Life to be considered by the Central and Provincial Governments for final legislation.

BANGALORE, R. W. BURTON.
3rd August, 1948. *Lieut.-Col.*

48.—WILD LIFE PRESERVATION: ANIMALS

In my contribution entitled 'Preservation of Wild Life—India's Vanishing Asset', in this issue of the *Journal*, it is stated that existing game laws and rules are quite efficient, the difficulty being their enforcement.

That statement has now to be considerably modified in respect to the Southern Circle of the Bombay Forest Administration as will be realized on perusal of the recent Resolution of the Government of Bombay in the Revenue Department excerpted below:—

"G.R. R.D. No. 3042/45 dated 7th April 1948.

Any bona-fide resident of Kanara who has been granted a gun licence for possessing a gun for protection of crops and cattle by the District Magistrate will be entitled to hunting and shooting in all kinds of forests within a radius of three miles from the village in which he resides or in which his lands lie and he will also be entitled to a free licence to hunt and shoot in reserved forests.

This licence will be issued to him by the Conservator of Forests, Southern Circle, on application. The licence will be issued in the form already in use for the issue of circle licences in the Southern Circle and the licensee will abide by the rules laid down in the licence.

Restrictions specified in the rules regarding shooting and hunting wild animals irrespective of their sex and species that destroy crops and cattle will be waived out and shooting will be allowed throughout the year provided no game is shot by anyone during the close season. Trapping by nets will also be allowed in all kinds of forests within a radius of three miles of the village.

The District Magistrate of Kanara will issue licences for guns in such a way that refusal or delay shall not be on flimsy grounds.

The following rewards will be given for killing the wild animals shown against them:—

Tiger and panther . . . each	... Rs. 25-0-0
Pig . . . each	... Rs. 2-0-0
Monkey . . . each	... Re. 1-0-0."

As to the provision against shooting in the close season, it has to be remarked that the shooting rules do not provide any close season—only a horn limit for deer. So the licensee has a free hand to do as he likes—slay any wild creature he wishes.

No rewards are offered for wild dogs which are numerous in the area. The carnivora, aided by the guns (28 gun clubs with 524 guns in one of the five Forest Divisions) will soon exterminate all the deer and some of the bison also. As the tiger and panther become more and more reduced in number the wild pig will greatly increase, also the monkeys, so that the larger wild life of the Southern Circle forests is doomed to extinction within quite a few years.

In my opinion this G.R. of 7th April 1948 is a complete negation of recognized methods of Conservation of Wild Life and a very strong argument indeed for the formation of a Wild Life Department in all Provinces.

BANGALORE, R. W. BURTON,
3rd August, 1948. *Lieut.-Col.*

ANNUAL REPORT OF THE BOMBAY NATURAL HISTORY SOCIETY FOR THE YEAR ENDING 31st DECEMBER 1947.

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List of members of the Executive and Advisory Committees elected for the year 1948.

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Mr. W. S. Millard, F.Z.S.

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Dr. M. Sharif, D.SC., Ph.D., F.N.I.	
Maj-Gen. Sir Sahib Singh Sokhey, I.M.S.	
Mr. Salim Ali (Hon. Secretary)	
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Lt.-Col. E. G. Phythian-Adams, O.B.E., F.Z.S., I.A. (Retd.)	*Nilgiris*
Dr. Baini Prashad, D.SC.	*New Delhi*

THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1947

THE SOCIETY'S JOURNAL

Volume 46 No. 4 and Volume 47 Nos. 1 and 2 were published during the year. The last was held up owing to labour troubles in the press and actually came into members' hands considerably later.

MAMMALS

Among the more noteworthy contributions published, the following may be mentioned:

'A Note on the Position of Rhinoceros in Burma' by W. F. H. Ansell. A comprehensive summary of records of rhinoceros in recent years to enable the present position to be compared with the pre-war period. From an analysis of the recent data concerning the Sumatran Two-horned Rhinoceros (*Dicerorhinus sumatrensis*) the author concludes that at present there are existing in all Burma not less than 21 rhinoceros and possibly as many as 45, though some might consider the latter figure too optimistic. He considers that *Rhinoceros sondaicus* is virtually extinct in Burma, and concludes his paper with a strong and well-reasoned plea for the appointment of a game warden and an efficient staff to take charge of Wild Life Conservation and for the improvement of existing sanctuaries and the establishment of new ones, and of National Parks. Many of Mr. Ansell's arguments and recommendations would apply with equal force to India as well.

A short but important taxonomic paper on 'Two new local races of the Asiatic Wild Ass' by the late R. I. Pocock is published in Volume 47, No. 1 (p. 143). The basis for this paper was provided by the fresh specimens collected in Kutch through the good offices of the late Maharao Shri Vijayarajji early in 1946. This paper incidentally is the last of the series of scientific papers we have been privileged to publish in the *Journal* over a period exceeding 40 years from the pen of this distinguished mammalogist.

Mr. C. G. Webb-Peploe, who is the head of the educational community of boys and girls centred in Dohnavur, contributed some interesting field notes on the mammals of his district, South Tinnevelly—the southernmost in Madras Province (Vol. 46, No. 4, p. 629). In the compilation of the notes he was aided by the observations of his pupils, many of whom are said to have become keen students of natural history. This is refreshing evidence, if any were needed, that Indian children under competent guidance can become quite as enthusiastic about nature study as their counterparts in the west. Mr, Webb-peploe's efforts deserve to be widely emulated.

BIRDS

'The Movements of the Rosy Pastor (*Pastor roseus*) in India' by Humayun Abdulali. An up to date summary of all available data as published at various times and in various journals, and from answers received to the questionnaire issued through the *Journal* (Vol. 45, p. 228) and in the military news sheet 'Contact'. A map with all the records of movements plotted on it gives a graphic idea of our knowledge and the gaps that remain to be filled.

'Birds of the Simla and Adjacent Hills' by A. E. Jones. A record of over 30 years painstaking collection and observation by a resident of Simla who had acquired more intimate knowledge of the lives and habits of the birds of this area than perhaps any other ornithologist living or dead. The first two parts of this paper were published during the year (Vol. 46, No. 1, p. 117 and No. 2, p. 219). It is not merely a bare enumeration of species, but gives terse points for field identification to assist visitors to the Simla Hills in recognising the birds they meet. It is greatly to be regretted that Mr. Jones died after completing the MS of the third part, which is due to appear in the first issue of 1948 (April). The fate of the remaining parts of this serial has become uncertain.

'The Birds of Delhi and District' by N. F. Frome (Vol. 47, No. 2, p. 277). A comprehensive account of bird life within a radius of 30 miles of Delhi compiled from notes kept by a band of enthusiastic and knowledgeable observers. This paper expands and brings up to date S. Basil-Edwardes's 'A Contribution to the Ornithology of Delhi' published in Vol. 31 of the *Journal* in 1926. It is of particular interest in providing a satisfactory basis for comparison with conditions prevailing before New Delhi became the full-fledged and populous metropolis it is today, and before all the irrigation and gardens and newly introduced roadside shade and flowering trees had altered the complexion of the city and its surroundings.

Other ornithological papers of especial interest include 'Ab-Istaden, a breeding place of the Flamingo in Afghanistan' by S. A. Akhtar (Vol. 47, No. 2, p. 308). The author has been able, by means of personal investigation, to confirm that the statement made by the Emperor Babur in his Memoirs, in the 16th century, of flamingoes breeding at the Ab-Istadeh lake in Afghanistan, some 40 miles distant from Ghazni, still holds good. He visited the place accompanied by a party of biology students of Kabul University and brought back tangible proof in the shape of eggs and a specimen of the birds that laid them—the Common Flamingo (*Phoenicopterus ruber roseus*). Some useful ecological notes on the breeding ground are given.

'The ornithological Diary of a Voyage of *S. S. Samluzon*' (across the North Atlantic from St. John N. B., and on to Karachi) by Major W. W. A. Phillips. In spite of the fact that this voyage was done in June and July when the vast majority of northern hemisphere sea birds are breeding and therefore confined to the neighbourhood of land, the author's record of the species encountered on the high seas is impressive and will form a welcome and useful guide to future voyagers on this route.

F. N. Betts's 'Bird Life in an Assam Jungle' (Vol. 46, No. 4, p. 667) is an attempt to compare the conditions and bird life of a small stretch of country in Assam with a parallel biotope in South India with which the author was previously familiar. The comparison is instructive in bringing home the importance of the role that ecology plays in the distribution of especially adapted forms, and how parallel ecological conditions foster the occurrence of closely allied or parallel forms of life, representing each other or filling well defined respective niches.

REPTILES AND FISHES

'The Reptiles of Cocanada' by Garth Underwood (Vol. 46, No. 4, p. 613) deals chiefly with the lizards and snakes of the coastal strip and furnishes some useful notes.

Among the more important papers on Fishes and Fisheries published during the year, are the following:—

'Fishing Contrivances used in H.E.H. the Nizam's Dominions' by S. Mahmood and M. Rahimullah (Vol. 46, No. 4, p. 649).

'Fish Survey of Hyderabad State' Part iv, by S. Mahmood and M. Rahimullah (Vol. 47, No. 1, p. 102).

'A Note on the collecting, conditioning and transport of fingerlings of *Catla catla* in the Madras Presidency' by N. Jagannadhan (Vol. 47, No. 2, p. 315).

'Note on Freshwater Fishes of Bombay and Salsette Islands' by C. V. Kulkarni (Vol. 47, No. 2, p. 319).

INSECTS

Parts xvii, xviii and xix of D. G. Sevastopulo's painstaking investigations on 'The Early Stages of Indian Lepidoptera' were published during the year. Other contributions in the entomological section were 'On the Biology of the Butterfly *Danaus chrysippus* and its Parasites' by Durgadas Mukerji and Basanta Kumar Behura, 'Notes on some butterflies from Penang and Wellesley Province, Malaya' by J. W. Rawlins and 'The Lac Insects of the West Coast of India' by S. Mahdihassan. On the economic side, of great usefulness will be found 'Studies on the Spotted Bollworms of Cotton—*Earias fabia* S. and *E. insulana* B.' by M. C. Cherian and M. S. Kylasam and 'Extent of Damage by the moth *Dichocrocis punctiferalis* Fb. to three strains of the Castor Plant' by A. C. Basu.

BOTANY

Three further parts of the serial on 'Some Beautiful Indian Climbers and Shrubs' were published during the year. It is hoped to conclude this series in 1948 after which it will be possible to proceed with our plan of publishing it in book form. This should prove an attractive publication and form a fitting companion to 'Some Beautiful Indian Trees' by Blatter and Millard.

Of systematic interest is a paper on 'Some new species of South Indian Plants' by K. Cherian Jacob. Abdul Hameed's 'Notes on the Fern and Fern Allies on Murree Hill' illustrated with 12 pages of beautiful black and white drawings should prove of considerable interest especially to readers residing or holidaying in the Western Himalayas. Fr. Santapau's 'Notes on the Convolvulaceae of Bombay' is a revision of the family as it concerns Bombay Province. The paper is based on a comparative study of the author's collections from Khandala together with the types and material at Kew Herbarium and of the literature on the family there available. It is a thorough piece of work and brings up to date, and replaces, Cooke's account of the family in 'Flora of the Bombay Presidency'. Botanists will be glad to learn that Fr. Santapau is following up this paper with a revision of the Solanaceae of Bombay which we hope to publish during 1948.

The systematic position of the family Moringaceae based on a study of the common Drumstick tree (*Moringa pterygosperma*) has been discussed by Messrs. Robindra Mohon Datta and Jatindra Nath Mitra. In a short statistical paper G. A. Kapadia lists 15 different types of hitheto unrecorded abnormalities in the flowers of *Quisqualis indica*.

On the side of popular natural history a paper on Cave Fauna by E. A. Glennie (Vol. 46, No. 4, p. 587) deserves particular mention as it opens up a fascinating and practically untouched field for investigation by naturalists in this country. The author discusses the modern theory of the formation and development of caves and the sorts of creatures capable of colonizing the deeper parts of caves including land animals and water animals, and the adaptations they undergo when they take to a troglophil existence. The author says 'A cave is a natural laboratory where some of the variable factors in the outside world are under control. Some creatures live on in them though they are no longer to be found outside' and draws attention to the significant fact that at the limits of the region of dispersal of certain groups of animals the living forms are only to be found in caves. He suggests careful collection and recording of cave faunas as likely to shed much light on the course of evolution and on the centres of origin of genera and their channels of distribution.

In 'The Islet' W. W. A. Phillips takes us to a delightful bird sanctuary in the North Central Province of Ceylon, a tank set in the midst of jungle surrounded by swamp where terns, stilts, great stone-plovers and many other birds nest. It is illustrated with some excellent bird photographs of the sort that one has come to associate with this versatile naturalist.

A namesake of the above, Col. B. T. Phillips of Kashmir, who is also familiar to readers as an ardent bird lover and photographer, follows up his previous Musings with 'Birds of a Srinagar Garden'. His series of articles, illustrated as they are with some of Col. Phillips best camara studies, form a pleasing addition to the bird literature concerning this erstwhile haven of peace.

The angler and the fisherman is well catered for by A. St. J. Macdonald whose name is to the modern fishing fraternity what Thomas's was to the devotees of the Rod on a bygone day. His experience of the sea-fishing to be had about Karwar and Malvan will be found somewhat depressing by enthusiasts fed on accounts of the sport previously to be had in these waters. But it must be remembered that Major Macdonald's trip was undertaken in October/November. There is apparently a steady falling off from year to year of the visits of the larger mackerel in whose wake the game fishes follow, and of recent years it seems that fishing for Bahmin is worthwhile only in August and September. As usual with this author some very useful information is appended for the benefit of prospective visitors in regard to accommodation, methods, time and tide, baits and costs.

To one obsessed with the wanderlust and to the seeker after birds in distant places P. I. R. Maclaren's 'Notes on the Birds of the Gyantse Road' have a special charm and appeal. This is the account of an ornithological trek in May 1946 to the high elevation lakes of Hram Tso and Kala Tso in Tibet, lying along the main treaty road to Lhassa. The ornithology of this neighbourhood was well chronicled by F. Ludlow in the *Ibis* of 1927 and 1928 and although the present article adds little materially to the above, it gives some useful and tantalising information concerning the area, and what the interested trekker should find there in the way of birds.

The Miscellaneous Notes section has always been popular with readers, and those published during the year present the usual diversity of interest and content. Our thanks are due to all those who contributed to sustaining the interest of the *Journal* and adding to its usefulness, and we trust that members will continue to co-operate with the editors in the helpful and practical way they have done.

An apology is again due to members for the delays that continue in the publication of the *Journal*. This is a matter in which our printers are apparently helpless to improve in spite of their regrets which are repeated and profuse, as also their promises. But some slight consolation, such as it is, may be derived from the fact that the printing trade is in more or less the same sorry plight all over the world.

The Committee again wish to express their thanks to the Council of the National Institute of Sciences of India for the grant of Rs. 750 made to the Society towards the cost of publishing the *Journal* during the year.

PUBLICATIONS

The Society put out no new publications during the year. Mr. Prater's Book of Indian Animals which was expected to be out in October was held up owing to labour troubles in the press and through other causes. The new edition of Some Beautiful Indian Trees for which print order has been placed with Messrs. Oliver and Boyd of Edinburgh for some considerable time has not materialised in spite of Mr. Millard's personal goading at the other end. The manuscript of the 'Book of Indian Butterflies' by Mr. Wynter-Blyth and most of the coloured and black and white plates are ready and should have gone to the press but for the anxiety of the Committee to lighten some of our financial burdens before we ventured to assume more. This caution is fully justified in view of the retardation in the sales of our existing publications that has set in since the end of the war, as reflected in the Revenue Account below. Satisfactory progress was made with the production in book form of Major Macdonald's serial on 'Circumventing the Mahseer', which was recently concluded in the *Journal*, and an edition of 1,000 copies is in the course of being printed. The book will make a valuable addition to the literature on Indian sporting fishes and angling and should prove of the greatest interest and usefulness to the angling fraternity. It contains practically all the information to be found in Thomas's Rod in India brought thoroughly up to date, plus a lot more such as the particulars relating to fishing localities. There are other popular natural history publications which the Society plans to produce in the near future. One of these is a series of small and elementary well illustrated and well produced booklets on various branches of Indian animal life, each carrying 16 coloured plates and about 3,500 words of text. These booklets will be translated into a number of Indian languages—Hindustani, Mahratti, Gujarati, Kannada and Bengali, to start with. They should help to supply a long felt and serious want, and become very popular provided we get the right sort of co-operation from the educational department.

REVENUE ACCOUNT

Actual receipts amounted to Rs. 33,820-12-0 as compared with Rs. 41,389-12-3 during the year 1946. The decrease in revenue of Rs. 7,569 was due mainly to decrease in sales of publications etc., as detained below. The revenue derived from sale of publications in 1947 was only Rs. 6,322-2-8 as against Rs. 9,280-1-0 in 1946.

——	*Revenue in* 1946			*Revenue in* 1947			*Difference*		
	RS	A	P	RS	A	P	RS	A	P
1. Publications	9,280	1	0	6,322	2	8	2,957	14	4
2. Interest on Investments ...	6,577	15	0	4,460	6	6	2,117	8	6
3. Outside works ...	2,055	7	8	444	12	8	1,610	11	0
4. Profit on sale of Investments	893	14	0	...			893	14	0
Total ...	18,807	5	8	11,227	5	10	7,579	15	10

Life Members. During the year 1947, 5 Life Members died and 14 joined increasing the total number from 201 to 210.

In 1947, 114 new members (including above) joined, 64 resigned and 10 died. The total number of members on 31st December 1947 was 1,329, an increase of 40 over 1946.

EDUCATIONAL ACTIVITIES

The popularization of nature study among school children and the general public has been seriously engaging the attention of the Society's Committee for a considerable time. It has been felt that to make the fullest benefit of the facilities offered by our excellent natural history section available to the public, a well thought-out educational programme was essential. The Government of Bombay have been approached with a view to their reviving the nature study and guide lecturing scheme that worked so successfully from 1926 to 1928 but which had to be discontinued thereafter owing to the then Government's financial stringency. Government's reaction seems to be favourable, and it is hoped that we shall soon be able to conduct a suitable scheme on a permanent basis. The Committee considered this matter of sufficient importance to go ahead with their plans even pending Government's sanction of the required funds since a man with the necessary qualifications happened to be immediately available. A Nature Education Organizer has been appointed to work under the direction of a special sub-committee of the Society, whose business it will be to prepare and carry out schemes for instructing local school teachers in the most profitable methods of conducting nature study classes with the help of the facilities the museum can offer, and of guide-lecturing the public in the natural history galleries. For the time being the salary of the Nature Study Organizer is met by an arrangement which happily throws no extra burden on the Society. But this is only a makeshift, and it is hoped that Government will take over the entire financial responsibility before long. The Education Department is eager to co-operate in our work, and we hope to put a part of the scheme (i.e. the training of secondary school teachers) into operation at an early date.

ACKNOWLEDGMENTS

The Committee wished to record its appreciation and gratefulness to Mr. Millard for his continued help in looking after the Society's interests in London.

STAFF

Mr. S. H. Prater who was the Society's Curator for over 25 years retired from service on 30th October. He had been preceded by Mr. C. McCann the Joint Curator in August. The almost simultaneous exit of both these experienced officials has put great handicaps in the efficient administration of the Society.

Until a suitable man can be found for the Curator's post, Mr. Sálim Ali the Honorary Secretary has been persuaded by the Committee to take on the additional responsibility of looking after the affairs of the Natural History Section of the Prince of Wales Museum. Efforts are being made to recruit a candidate of the required qualifications, but it seems that we shall have to continue to make the best of it for some considerable time to come, and it may ultimately be possible to overcome the difficulty only by sending a promising candidate abroad for training in some of the American or European Museums.

APPENDIX TO HONORARY SECRETARY'S REPORT COVERING THE PERIOD JANUARY-JULY 1948

(read out at the Annual General Meeting, 11 August 1948)

PUBLICATIONS

1. The second volume of the Society's Indian Natural History Series 'The Book of Indian Animals' by Mr. S. H. Prater was released by the press in April. Of an edition of 3,000 copies about 700 copies have so far been sold.

2. In July we published 1,000 sets of coloured picture post cards of Indian Birds from plates specially painted for the 4th edition of 'The Book of Indian Birds' by D. V. Cowen.

3. 'Circumventing the Mahseer and other Sporting Fish in India and Burma' by Major Macdonald—Print order has been placed for an edition of 1,000 copies. The book is expected to be out by the end of August.

In May this year an application had been addressed to the Secretary of the National Institute of Sciences for a grant of Rs. 1,88,000 from the Govenment of India for the Society's programme of popular natural history publications during the next two years. This included:

(i) the first two volumes of a comprehensive, fully illustrated handbook of Indian birds in 5 volumes under the joint authorship of Sálim Ali and Dr. Dillon Ripley of Yale University.

(ii) 'The Book of Indian Butterflies' by M. A. Wynter Blyth which is to be Volume III of the Society's Indian Natural History Series, and

(iii) two of the colour illustrated popular and simply written booklets in English and various Indian languages dealing with a number of natural history subjects, such as birds, wild animals, domestic animals, poisonous creatures, flowering trees, insects and others, which it was resolved to publish at one of the meetings of the Society's Executive Committee.

It is gratifying to report that the application was approved by the Council of the National Institute of Sciences and ratified by the general body. They have recommended to the Government of India that 50 per cent of the required grant should be made to the Society. It is customary with the Government of India's grants for scientific research and publications that the remaining 50 per cent must be found by the applicant.

When the Government of India has accepted this recommendation and sanctioned the grant, we shall have to cast about for ways and means of raising the balance.

MEMBERSHIP

A special appeal to all members to assist in increasing membership was made after the last General Meeting by circular letter and by a leaflet inserted in the *Journal*. The result has been fairly satisfactory, but there is need for incessant effort on the part of members to enable us to keep abreast of resignations which under the circumstances it is feared are bound to come in increasing numbers from European members who have left the country. Since the commencement of the year 89 new members joined and 41 resigned leaving us 48 to the good.

NATURE EDUCATION

A Nature Study Organiser was appointed in February. He has been busy preparing guides to the Natural History galleries in English and the local languages, and translating the more important labels into Marathi and Gujarati. He has been in close touch with the Education Department with a view to securing their co-operation which we are glad to find readily forthcoming. Arrangements were completed for nature study teachers of local secondary schools to be put through a course of 3 lectures on various branches and aspects of animal life followed by guided tours through the galleries. The object of these activities being to instruct the teachers in the methods of getting their pupils interested in natural history, to acquaint them with the facilities the Museum has to offer in the shape of exhibits displayed in the galleries. 150 local schools expressed their desire to take advantage of the scheme. Lectures began on 29th June 1948 and by 1st week October it is expected that over 300 teachers will have been through the course. These teachers will be suitably assisted when they subsequently bring their pupils to the Museum, and it is hoped that our efforts will result in a more intelligent use being made of the Natural History Section.

JOURNAL

While every effort is being made to keep up the membership strength of the Society, yet it was felt to be essential that an unbroken publication of the *Journal* should be assured regardless of the vicissitudes of membership. It was therefore decided to appeal to Government for an annual grant-in-aid of Rs. 12,000 towards its publication for 5 years, by which time it is hoped that the Society's finances will have improved and stabilized. Rs. 8,000 of this amount was asked for from the Central Government and Rs. 4,000 from the Government of Bombay. It is hoped that our representations will receive sympathetic consideration.

CONSERVATION OF WILD LIFE

In view of the political and administrative changes that have taken place in India since the last Annual General Meeting and from the reports received by the Society from various parts of the country, about the slackening in the observance of laws governing the killing of wild animals, it became obvious that if wild animals in general were to be saved from extinction it was imperative that steps should be taken without delay to arouse and educate public opinion to a realization of the important place wild life occupies in our national economy.

The first step essential towards this goal was the immediate tightening up of existing laws regarding killing of animals and close seasons. It also seemed imperative that adequate measures, both legislative and practical be taken before it is too late. Therefore Lt.-Col. R. W. Burton, a member of our Advisory Committee and a veteran sportsman and naturalist with over 60 years experience of conditions of wild life in India took the initiative of writing a comprehensive pamphlet stressing the urgent need for immediate steps towards its conservation. 400 copies of this pamphlet were printed, part of the cost being generously borne by Col. Burton himself.

Copies of the pamphlet together with suitable covering letters from the Society were sent out to the Governors-General of India and Pakistan, to the Prime Ministers and members of the Cabinets of the two dominions and also to all ministers of Provincial Governments, Secretaries and departmental heads, Chief Conservators and Conservators of Forests and prominent members of the Constituent Assemblies of India and Pakistan and of all Provincial Legislatures. 500 copies of a Special Appeal relating to Reserved Forests, also prepared by Col. Burton have been distributed among a wide circle of divisional and other forest officers throughout the country. A precis of the pamphlet was widely circulated through the newspapers and press services all over the country and it is hoped that by this means, sufficient publicity has been given to this important question by way of introduction to the further measures that we propose to take.

We are fortunate in having been able to secure through the kindness of our member, His Highness the Maharao of Kotah, the excellent wild life movie films made by him in the Kotah jungles which you will presently see. This is a living instance of how sportsmen can share their joy and opportunities of a close acquaintance with wild life with others less fortunately placed. The films also emphasize that wild animals can be enjoyed far more as living creatures than as musty trophies adorning ancient walls.

BOMBAY NATURAL HISTORY SOCIETY

BALANCE SHEET AS AT 31st DECEMBER, 1947

LIABILITIES	Rs A P	Rs A P	Rs A P
Life Membership Fees:			82,440 0 0
Donations for specific purposes:			
From States for Survey Expenses ...		13,900 0 0	
For Book of Indian Animals		1,626 10 3	
,, Bastar & Kankar State Survey ...		2,137 3 0	17,663 13 3
Sundry Creditors:			
For Printing, etc., of Journals ...		5,412 15 6	
,, *Expenses:*			
Royalties to Authors of Books ...		737 0 0	
Outstanding Creditors for Expenses (Rent & Audit Fee)		450 0 0	
,, *Others:*	RS A P		
Amount received in advance Book of Indian Animals ...	54 11 0		
Beautiful Indian Climbers and Shrubs	21 12 0	76 7 0	6,716 6 6
Surplus Account:			
Balance as per last Balance Sheet ...		45,022 0 11	
Add.—Stock of Books as on 1st January 1947, brought to account:			
(*a*) Book of Indian Birds		19,440 14 0	
(*b*) Game Birds of India—Vol. III ...		5,284 0 0	
Stock of old Journals as on 31st December, 1947		3,000 0 0	
		72,746 14 11	
Less—Royalty on sale of "Book of Indian Birds" in 1946, not then provided but now paid		1,485 0 0	
		71,261 14 11	
Less—Excess of Expenditure over income...		19,021 1 6	52,240 13 5
Total ...			1,59,061 1 2

ASSETS	Rs A P	Rs A P
Investments—At Holding value or Market value, whichever is lower:—		
Rs. 10,000 3% Loan 1951-54	9,800 0 0	
,, 14,000 4% Bombay Port Trust Bonds.	10,780 0 0	
,, 15,000 4% Bombay Improvement Bonds ...	11,400 0 0	
,, 35,000 3% ,, Funding Loan 1966-68	35,812 10 0	
,, 25,000 3% Conversion Loan 1946 ...	25,000 0 0	
,, 15,000 3% First Development Loan 1970-75 ...	14,615 10 0	
Rs. 1,15,000 (Market value at 31st Dec. 1947—was Rs. 1,20,567-8-0).	1,07,408 4 0	
£450 3% Defence Bonds	6,133 5 4	1,13,541 9 4
Furniture:		
As per last Balance Sheet	1,715 0 0	
Less—Depreciation...	25 0 0	1,690 0 0
Sundry Debtors		3,635 9 6
Advance to the Staff		243 1 0
Advances for Publications:		
Poisonous Terrestrial Snakes of India, Burma and Ceylon	75 0 0	
Some Beautiful Indian Climbers and Shrubs	4,215 4 4	
Book of Indian Butterflies	697 7 6	
Book of Indian Animals	4,581 3 0	9,568 14 10
Stock of Books, Calendars, etc., on hand (at cost) (As certified by the Secretary)		
Book of Indian Birds 2,761 copies ...	15,876 0 0	
Game Birds of India Vol. III 488 copies...	5,056 0 0	
Calendars—15 Nos.	18 12 0	
Old Journals—12,000 copies	3,000 0 0	
Special Set of Books (Special Numbers) and Specimen intended for re-sale to members)	530 0 0	24,480 12 0
Cash—		
With National Bank of India, Ltd., Bombay	917 13 2	
With National Bank of India, Ltd., London, £355	4,733 5 4	
On hand	250 0 0	5,901 2 6
Total ...		1,59,061 1 2

Note.—A stock of valuable research collection and Library Volumes have not been taken into account on the Assets side of the Balance Sheet.

We have prepared the above Balance Sheet from the books of account maintained and from the information given to us, and have verified the Investments. In our opinion, such Balance Sheet represents a true and correct view of the state of the Society's affairs according to the best of our information and explanation given to us.

Bombay, *28th July, 1948.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants } Auditors.
Registered Accountants }

BOMBAY NATURAL HISTORY SOCIETY

Dr. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1947 *Cr.*

EXPENDITURE	Rs A P	Rs A P	INCOME	Rs A P	Rs A P
To Salaries (including Dearness Allowance)		33,328 11 0	By Subscriptions		21,492 11 6
,, Contribution to Staff Provident Fund ...		1,803 5 0	,, Entrance Fees		1,100 10 8
,, Cost of Printing, etc., of Journal ...		10,486 15 7	,, Sales of :		
,, Rent		1,932 0 0	Old Journals	1,774 2 3	
,, General Charges		875 9 2	Society's Publications	203 13 0	
,, Stationery and Printing		563 4 0	Snake Charts	219 3 0	
,, Postage		1,720 13 9	,, Profit on Sales of :		2,197 2 3
,, Library		791 3 0	Game Birds of India, Vol. III.. ...	36 0 10	
,, Fire Insurance		152 0 0	Book of Indian Birds	1,988 6 8	
,, Audit Fee		250 0 0	Calendars	2,100 8 11	
,, Natural History Award		300 0 0			4,125 0 5
,, Loss on Sale of Investments ...		613 0 0	,, Interest on Investments		4,460 6 6
,, Depreciation on Furniture		25 0 0	,, Sundries—Profit on outside work ...		444 12 8
			,, Excess of Expenditure over Income Transferred to Balance Sheet		19,021 1 6
Total ...		52,841 13 6	Total ...		52,841 13 6
To *Game Birds of India Vol. III*			By Sales during the year		458 4 0
,, Stock on 1st January, 1947 Bound Copies	1,284 0 0		,, Stock on 31st December, 1947, Bound Copies	1,056 0 0	
,, Stock on 1st January, 1947 Unbound Copies	4,000 0 0		,, Stock on 31st December, 1947, Unbound Copies	4,000 0 0	
		5,284 0 0			5,056 0 0
,, Royalties to Author		194 3 2			
,, Profit transferred to Income and Expenditure Account		36 0 10			
Total ...		5,514 4 0	Total ...		5,514 4 0
To *Book of Indian Birds 4th Edition*			By Sales during the year		7,708 0 8
,, Opening Stock 1st January, 1947 ...		19,440 14 0	,, Stock on 31st December, 1917		15,876 0 0
,, Royalties to Author		1,469 0 0			
,, Expenses for Packing, Postage, etc. ...		685 12 0			
,, Profit transferred to Income and Expenditure Account		1,988 6 8			
Total ...		23,534 0 8	Total ...		23,584 0 8
To *Calendars*			By Sales during the year		7,430 11 11
,, Cost of Printing and Supplying Calendars		5,318 15 0	,, Stocks on 31st December, 1947		1 12 0
,, Profit transferred to Income and Expenditure Account		2,100 8 11			
Total ...		7,449 7 11	Total ...		7,449 7 11

BOMBAY, *28th July, 1948.*

(Sd.) A. F. FERGUSON & CO.,
Chartered Accountants, } AUDITORS.
Registered Accountants,

MINUTES OF THE ANNUAL GENERAL MEETING OF THE BOMBAY NATURAL HISTORY SOCIETY HELD IN THE LECTURE ROOMS OF THE B.E.S.& T. COMPANY, ELECTRIC HOUSE, ORMISTON ROAD, BOMBAY, ON WEDNESDAY THE 11th AUGUST 1948, AT 6 P.M.

1. Managing Committee's report for the year ended 31st December 1947, copies of which were placed in the hands of members, was considered as read.

2. The Honorary Secretary read out some additional notes dealing with the Society's activities and membership position during the 8 months of 1948. He referred to the efforts being made to increase membership and to the various applications for subsidies made to the Governments of India and Bombay for the publication programme of the Society for the next 2 years, for the Nature Study programme at the Museum and towards the publication of the Society's *Journal*. He also gave particulars of the Society's efforts in the cause of wild life conservation in India (see page 792).

3. The Honorary Treasurer explained various points in connection with the Balance Sheet and Statement of accounts and pointed out that the large excess of expenditure over income (about Rs. 19,000) was of a non-recurring nature and due chiefly to the gratuities that were being paid to 4 members of the staff who had retired last year after long service.

Mr. A. A. A. Fyzee suggested that it might be an advantage for the Society to invest some part of its Reserve Fund in sound industrial shares rather than entirely in Government securities. He suggested that in that way we could improve the returns we were getting from our investments. The Chairman said that this matter would be looked into by the Honorary Secretary and Honorary Treasurer who would report their views and recommendations to the Committee.

4. The Executive and Advisory Committees for 1948 as proposed in the circular to members were duly elected, there being no fresh nominations received.

The election of Sir Chintaman Deshmukh in place of Mr. Farrokh E. Bharucha (deceased) which had previously been done by the Executive Committee by circular was ratified.

5. The Chairman explained why it had become necessary to increase the membership fees as specified in the Agenda. When the costs of printing, wages, dearness allowances and other items of expenditure had gone up so considerably it was not reasonable to expect the Society to continue to provide the same benefits to its members at a rate of subscription that was fixed many years ago in normal times. He asked the meeting to ratify the decision of the Executive Committee which had been reached after a great deal of discussion and deliberation.

No objection was raised by any of the members present and the resolution stands confirmed.

From 1st January 1949 the ordinary membership fee will be Rs. 30 per annum instead of Rs. 25, the entrance fee Rs. 25 instead of Rs. 10 and the life membership fee Rs. 500 instead of Rs. 350.

The Chairman announced with regret the death of the following members:—

1. His Highness Maharao Shri Vijayarajji of Kutch, a Vice Patron of the Society and one of its most sympathetic friends and benefactors, always ready and eager to help in all its activities, both in the way of facilities and financial support.

2. Mr. Farrokh E. Bharucha who was a valued member of the Executive Committee for over 10 years, and

3. Mr. T. R. Bell, the well-known entomologist who was actively associated with the Society from its inception and was one of its moving spirits in its earlier days.

On the conclusion of the formal meeting, a series of wild life and shikar movies made by His Highness the Maharao Sahib Bahadur of Kotah in the forests of his State, and kindly lent by him for the occasion of the Annual General Meeting, were shown to members and their friends. These films were excellent and were greatly appreciated and enjoyed by a large gathering.

CATALOGUE OF BOOKS IN THE BOMBAY NATURAL HISTORY SOCIETY'S LIBRARY

Part I—Mammals

M = Mammals—General.
Ms = Mammals—Shikar & Sport.
MFR = Fauna of British India—Mammals—Reference volume; not lent out.

Serial No.	Accession No.	Author	Title of Book
1	1/M 29	Anderson, John	Catalogue of Mammalia, Part I (In the Indian Museum), 1902.
2	1/M 218	do. do.	Zoology of Egypt—Mammalia, 1902.
3	1/M 39	Anderson, Knud	Chiroptera, Vol. I, 1912.
4	1/Ms 123	Andrews, Roy Chapman and Andrews, Yvette Borup	Camps & Trails in China, 1919.
5	1/Ms 199	Baillie, Mrs. W. W.	Days and Nights of Shikar.
6	1/Ms 97	Baker, E. C. Stuart	Mishi the Man-eater, and Other Tales of Big Game, 1928.
7	1/Ms 137	Baker, S. W.	Wild Beasts and Their Ways 1891.
8	1/Ms 141	do.	Eight Years in Ceylon, 1891.
9	1/Ms 153	do.	The Nile Tributaries of Abyssinia, 1886.
10	1/Ms 135	Ball, V.	Jungle Life in India, 1880.
11	1/Ms 126	Barclay, Edgar N.	Big Game Shooting Records, 1932.
12	1/M 55, 55A 55B	Barrett-Hamilton G. E. H.	A History of British Mammals, in 3 Vols.
13	1/M 6	Beddard, F. E.	Mammalia, 1902
14	1/Ms 129	Best, James W.	Tiger Days, 1931.
15	1/Ms 130	do. do.	Indian Shikar Notes with Reference to C.P., 1931.
16	1/Ms 139	do. do.	Forest Life in India, 1935.
17	1/M 56	Bewick	A General History of Quadrupeds.
		Blaine Gilbert	(*See* Lydekker and Blaine, Jt. Authors.)
18	MFR 179	Blanford, W. T.	Fauna of British India—Mammals, Vol. I, 1888-1891.
19	MFR 180	do.	Fauna of British India—Mammals, Vol. II, 1888-1891.
20	MFR 181	do.	Fauna of British India—Mammals, Vols. I and II, 1888-1891.
21	MFR 188	do.	Fauna of British India—Mammals, Vol. I, 1888-1891.
22	MFR 189	do.	Fauna of British India—Mammals, Vol. II, 1888-1891.
23	MFR 190	do.	Fauna of British India—Mammals, Vols. I and II, 1888-1891.
24	1/M 32	Blyth, E.	Catalogue of Mammalia in the Museum, Asiatic Society, 1863.

Serial No.	Accession No.		Author	Title of Book
25	1/M	43	Blyth, E.	Catalogue of Mammals and Birds of Burma, 1875.
26	1/M	23	Bonhote, L.	Mammal Papers, 1898-1906.
27	1/Ms	168	Boulenger, E. G.	Searchlight on Animals.
28	1/Ms	93	Brander, Dunbar A. A.	Wild Animals in Central India, 1927.
29	1/Ms	85	Brown, J. Moray	In the Days when we went Hog-Hunting.
30	1/Ms	121	do. do.	Stray Sport Vol. I, 1893.
31	1/Ms	122	do. do.	do. Vol. II, 1893.
32	1/M	72	Broom, R., & Schepers, G. W. H.	The South African Fossil Ape-men, 1946.
			Buck, Walter J.	(*See* Chapman, Abel, & Buck, W. J.)
33	1/Ms	161	Burke, W. S.	The Indian Field Shikar Book, 1904.
34	1/Ms	161	do.	The Indian Field Shikar Book, 1906.
			Burlace, J. B.	(*See* Lydekker, R., & Burlace, J. B.—Joint authors.)
			do.	(*See* Dollman, J. P., & Burlace J. B.—Joint authors.)
35	1/Ms	124	Burrard, Major J.	Big Game Hunting in the Himalayas and Tibet, 1925.
36	1/M	51	Burrel, Harry	The Platypus, 1927.
37	1/M	60	Burton, R. G.	The Book of the Tiger, 1933.
38	1/Ms	94	do.	A Hand-book of Man-eaters.
39	1/Ms	127	„	Sports and Wild Life in the Deccan, 1928.
40	1/Ms	140	Casserly, Lt.-Col. Gordon	In the Green Jungle, 1927.
41	1/Ms	146	do. do.	Dwellers in the Jungle, 1925.
42	1/Ms	110	Champion, F. W.	With a Camera in Tiger-Land, 1927.
43	1/Ms	198	Chapman, Abel, & Buck, Walter	Unexplored Spain.
44	1/Ms	173	Christensen, Lars	My Last Expedition to Antarctic, 1936-1937.
45	1/Ms	104	Christopher, Sydney A.	Big Game Shooting in Lower Burma, 1916.
46	1/Ms	99	Corbett, Jim	Man-eaters of Kumaon, 1944.
47	1/Ms	109	Cumming, Gordon R.	A Hunter's Life in S. Africa, Vol. I, 1850.
48	1/M	54	Darling, Fraser F.	A Herd of Red Deer, 1937.
49	1/Ms	169	Darwin, Charles	A Naturalist's Voyage Round the World, 1890.
50	1/M	200	Dewar, Douglas	Beasts of an Indian Village, 1923.
51	1/Ms	115	Digby, Bassett	The Mammoth and Mammoth Hunting in North East Siberia, 1926.
52	1/M	40	Dobson, G. E.	Catalogue of Asiatic Chiroptera, (Indian Museum, Calcutta), 1876.
53	1/M	41	Dollman, J. G.	B. M. Catalogue of Selous Collection of Big Game, 1921.
54	1/Ms	82	Dollman, J. G. & Burlace J. B.	Rowland Ward's Records of Big Game, 9th Edition, 1928.
			(*See* Lydekkar, R. & Burlace, J. B.)	Rowland Ward's Records of Big Game, 7th Edition, 1914.
55	1/M	9	Drake-Brockman, R. E.	The Mammals of Somaliland, 1910.

Serial No.	Accession No.		Author	Title of Book
56	1/Ms	134	Duff, H. L.	NYASALAND (UNDER THE FOREIGN OFFICE), 1903.
57	1/Ms	67	Dugmore, Radcliffe A.	CAMERA ADVENTURES IN THE AFRICAN WILDS, 1913.
58	1/Ms	98	Edwin, Maribel	WILD LIFE STORIES.
59	1/M	12	Ellerman, J. R.	THE FAMILIES AND GENERA OF LIVING RODENTS, VOL. I, 1940.
60	1/M	13	do.	THE FAMILIES AND GENERA OF LIVING RODENTS, Vol. II, 1941.
61	1/M	14	do.	THE FAMILIES AND GENERA OF LIVING RODENTS, VOL. I, 1940.
62	1/M	15	do.	THE FAMILIES AND GENERA OF LIVING RODENTS, Vol. II, 1941.
63	1/M	17	Elliot, Walter	CATALOGUE OF MAMMALIA IN THE SOUTHERN MAHRATTA COUNTRY.
64	1/Ms	101	Ellison, Bernard C.	H. R. H. THE PRINCE OF WALES'S SPORT IN INDIA, 1925.
65	1/M	208	Evans, G. H.	ELEPHANTS AND THEIR DISEASES, 1910.
66	1/Ms	95	Evans, G. P.	BIG GAME SHOOTING IN UPPER BURMA, 1911.
67	1/Ms	92	Fletcher, F. W. P.	SPORT ON THE NILGIRIS AND IN WYNAAD.
68	1/M	222	Flower, William Henry	OSTEOLOGY OF THE MAMMALIA, 1885.
69	1/M	204	Forbes, Henry O.	MONKEYS, Vol. I, 1894.
70	1/M	205	do. do.	do. Vol. II, 1894.
71	1/Ms	143	do. do.	A NATURALIST'S WANDERINGS IN THE EASTERN ARCHIPELAGO, 1885.
72	1/Ms	108	Forsyth, Capt. J.	THE HIGHLANDS OF CENTRAL INDIA, 1889.
73	1/Ms	128	Francis, Capt. F. C.	THREE MONTHS' LEAVE IN SOMALILAND, 1895.
74	1/M	5	Frank, Finn	STERNDALE'S MAMMALIA OF INDIA, 1884.
75	1/M	48	Frick, Childs	HORNED RUMINANTS OF N. AMERICA, 1937
76	1/Ms	156	Gara, L.	CHASSE ET CAPTURE DU GROS GIBIER DANS L'EST AFRICAN, 1933.
77	1/Ms	157	do.	CHASSE ET CAPTURE DU GROS GIBIER DANS L'EST AFRICAN, 1933.
78	1/M	69	Gardiner, Stanley J.	THE FAUNA AND GEOGRAPHY OF THE MALDIVE AND LACCADIVE ARCHIPELAGOES, Vol. I, 1903.
79	1/M	70	do. do.	THE FAUNA AND GEOGRAPHY OF THE MALDIVE AND LACCADIVE ARCHIPELAGOES, Vol. II, 1906 (with Supplements i-ii).
80	1/M	74	Gervais, M. Paul	HISTOIRE NATURELLE DES MAMMIFERES.
81	1/Ms	193	Gosse, Philip	MEMOIRS OF A CAMP FOLLOWER, 1934.
82	1/Ms	195	Gouldsbury, C.E.	TIGER-SLAYER BY ORDER, 1916.
83	1/Ms	171	Guillemard, F. H. H.	THE CRUISE OF THE MARCHESA, Vol. I, 1886.
84	1/Ms	172	do.	THE CRUISE OF THE MARCHESA, Vol. II, 1886.

Serial No.	Accession No.	Author	Title of Book
85	1/M 79	Guy, Babault	Recherches Zoologiques(French).
86	1/Ms 100	Haig-Brown, Allan R.	My Game Book, 1913.
87	1/Ms 150	Hale Carpenter, G. D.	A Naturalist in East Africa, 1925.
88	1/Ms 111	Hamilton, Genl. Douglas	Records of Sport in S. India, etc., 1892.
89	1/Ms 112	Hamilton, Stevenson	Our South African National Parks, 1940.
90	1/Ms 119	Handley, Leonard M. H.	Hunter's Moon, 1933.
91	1/M 68	Harmer, S. F.	Report on Cetacea, 1914.
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